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### DIESEL RAILWAY TRACTION

*A Supplement illustrating and describing developments in Diesel Railway Traction is presented with each copy of this week's issue.*

### "Cock o' the North" in Paris

THE transport industry is faced at the present by many problems to the solution of which the experience of different countries can make substantial contributions. The exhibition of the L.N.E.R. 2-8-2 express locomotive *Cock o' the North* at the Gare du Nord in Paris, together with one of the latest super-Pacifics of the Chemin de fer du Nord, therefore possessed a special significance, to which M. Le Besnerais, General Manager of the Nord, paid due attention in his speech at the opening ceremony. He remarked that while *Cock o' the North* represented a British contribution towards the improvement of a public service which was daily subjected to more exacting demands, its designer, Mr. H. N. Gresley, had emphasised his debt to French locomotive practice in such matters as blast-pipe design, feed-water heater, and the layout of steam pipes. This avowal of indebtedness was all the more gratifying in that Mr. Gresley could himself claim to have pioneered the idea of a high-pressure streamlined engine. It should also be recalled that Stephenson used a Séguin pattern boiler in the *Rocket*, and that he had not only created an industry of world-wide ramifications but had indirectly endowed the French language with a technical vocabulary affording permanent proof of the close liaison between railways on both sides of the Channel.

* * * *

### Writing on the Wall

The annual wall calendar published by the Committee on Public Relations of the Eastern Railroads in the United States again serves as a graphic reminder of how many days' receipts are required for the payment of a year's wages and operating expenses, and how few then remain to cover interest and fixed charges. The figures are based on the 1933 statistics for the Class I railways, and they show that eighteen additional days would have been necessary to earn the full requirements of compulsory liabilities. Even after expanding the year to 383 days, the American railways would still have needed extra time to earn a surplus for dividends. We learn from astronomers that the year on the planet Mars is 322 days longer than our own, a fact which possibly ensures to the Martians a satisfactory return on investments in their system of canals. But here we are bound to a more limited measure, and since all our passion for restrictions will not suffice to retard our rate of progress round the sun, there seems to be but one other course open. Time is immutable for reasons beyond our control, so the obvious alternative is to attack the flexible element in the problem and seek an expansion of purchasing power.

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### The Week's Traffics

Decreases in the aggregate for the past week are shown by the four group companies, though the Southern has a small increase on the passenger side, the L.M.S. and the Great Western have small advances in merchandise, and the L.M.S. one in coal. For the seven weeks of the year to date the passenger train traffics are all on the right side, the totals being £6,927,000, an increase of £140,000 or 2·06 per cent. The Great Western is £24,000 to the good in merchandise traffics for the seven weeks, but the other three companies are down in this respect, and coal class receipts have fallen in every instance. London Transport receipts for the past week are up £6,600.

| | 7th Week | | | | Year to date. |
|---|---|---|---|---|---|
| | Pass., &c. | Goods, &c. | Coal, &c. | Total. | Inc. or dec. |
| | £ | £ | £ | £ | £ % |
| L.M.S.R. .. | − 7,000 | + 5,000 | + 1,000 | − 1,000 | − 9,000 − 0·12 |
| L.N.E.R. .. | − 2,000 | − 7,000 | − 5,000 | − 14,000 | − 60,000 − 1·07 |
| G.W.R. .. | − 2,000 | + 1,000 | − 6,000 | − 7,000 | + 18,000 + 0·59 |
| S.R. .. .. | + 2,000 | − 4,500 | − 1,500 | − 4,000 | − 11,000 − 0·48 |

Receipts of the Great Northern Railway (Ireland) for the past week show no change.

* * * *

### Restoring Export Trade

A practical suggestion for the restoration of exports from Great Britain was put forward by Mr. Bernard D. F. Docker, J.P., Chairman of the Birmingham Railway Carriage & Wagon Co. Ltd., in his speech at the annual general meeting of the company last Tuesday (see page 349). Emphasising the importance of the export trade to this country, Mr. Docker confessed he still cherished a hope that it might be restored to its former proportions and advocated a reciprocal arrangement whereby it might be exacted that the countries from which we buy such quantities of agricultural and other produce should purchase rolling stock and machinery from British manufacturers. The plan commends itself by the fact that instead of attacking international trade problems by restriction of production, it aims at stimulating the exchange of goods between producers of different commodities through the channels of reciprocity. Increased

production, with its potentiality of widespread plenty, provides more incentive than ever before for highly industrialised countries to sell their surplus products abroad, and Mr. Docker's scheme also leaves its participants free to concentrate upon the types of production for which they are best suited.

* * * *

### Mersey Railway

Steady progress has been made by the Mersey Railway since 1923 when it began to earn the full dividend on its 3 per cent. preference stock, and it shares with the railways of the former Underground group the distinction of having improved its position since the war. In 1913 only 12s. 4d. per cent. was paid on the 3 per cent. debenture stock, and for the year 1927 the first dividend was paid on the ordinary stock since the opening of the line in 1886. An order has now been issued by the Ministry of Transport authorising extensions at Liverpool Central station, which will enable longer trains to be used during the rush hours.

| | 1934 | 1933 | 1932 |
|---|---|---|---|
| | £ | £ | £ |
| Gross receipts .. .. .. | 213,814 | 209,536 | 211,933 |
| Expenditure .. .. .. | 128,174 | 126,162 | 129,242 |
| Net receipts .. .. .. | 85,640 | 83,374 | 82,691 |
| Net revenue .. .. .. | 86,047 | 82,889 | 82,710 |
| Deb. and pref. payments .. | 75,615 | 74,529 | 74,529 |
| Ordinary dividend .. .. | 10,592 | 7,061 | 7,061 |
| Carried forward .. .. | 3,342 | 4,502 | 4,203 |

The dividend on the ordinary stock is ¾ per cent., comparing with ½ per cent. for 1933 and 1932.

* * * *

### Increase in U.S.A. Railway Efficiency

In 1920 it took 172 lb. of coal to move a thousand gross ton-miles on the railways of the United States. Thirteen years later the amount of coal required for the same work had dropped to 121 lb. Other factors which contributed to the overall efficiency of American railways were an increase, between 1899 and 1933, in the tractive force of locomotives of 270 per cent. alongside an increase in the number of locomotives of only 47 per cent.; an increase in the number of freight cars by 57 per cent., which represented an increase in the carrying capacity of 85 per cent.; an increase in the railway staff of only 7 per cent., although the ton-miles of freight handled increased 34 per cent., and the number of freight train miles decreased by 22 per cent. Quoting these figures, the *Commercial and Financial Chronicle* (U.S.A.) remarks that all this was being done while the railway working day was reduced to eight hours. We would add, also, that with this remarkable improvement in railway efficiency, an improvement at least paralleled by the progress of industrial efficiency generally, the people of the United States of America were in 1933 poorer than ever from the point of view of the individual. Such is the complete lack of progress in the system of monetary accountancy that, as real wealth increases, the individual actually becomes worse off; an unnecessary and absurd situation in which all industrial countries share.

* * * *

### Speed Comparisons

Many comparisons of railway speeds are useless unless all the relevant factors are taken into account. They are worse than useless when, as in the case of the record American run with a steam-hauled express from Chicago to Milwaukee on July 20 last and recorded in detail in THE RAILWAY GAZETTE of October 5, 1934, a flying pass-to-pass section of the journey is compared with the start-to-stop speed of the previous steam record, which was the 81·7 m.p.h. of the Great Western Railway Cheltenham Flyer from Swindon to Paddington on June 6, 1932. The issue of *Baldwin Locomotives* for October, 1934, calmly states once more that the American pass-to-pass average of 89·9 m.p.h. over the 68·9 miles from Mayfair to Lake was "almost nine miles per hour faster than the best previous record for a run of similar length," and then quotes the G.W.R. start-to-stop speed to which reference has just been made. Actually the British express on this occasion maintained a pass-to-pass average of 87·5 m.p.h. for 70 miles continuously, so that the difference is not 8·3 m.p.h., but 2·4 m.p.h. only in favour of the American flier. From start-to-stop the British train had the advantage by 5·6 m.p.h., so that honours in this respect may be regarded as "easy." But the American engine's 94 lb. of coal per mile probably nearly trebled the consumption on the English run. There is another remarkable feature of the comparison which no writer has yet stressed. The American locomotive weighed 168 tons, tender 124 tons, and train 365 tons; the corresponding English weights were 80, 47, and 186 tons respectively. If tender and train are added together, it will be found that the proportion of trailing to engine weight in each case is identical; both locomotives were hauling 2·91 times their own weight.

* * * *

### Street Lights and Railway Signals

At the time when a white light was used for the "clear" night indication in running signals, we knew of several cases where the illumination of street lamps clashed with the signal lights—a difficulty that was overcome by the local authorities blinding the light of the street lamp on the side which faced the signal. But we do not remember any situation comparable with that which has arisen on the Southern Railway between Brockley and New Cross Gate, as recorded in our issue of January 25, where the company has been compelled by the street illumination to increase the intensity of the signals. In view of the complaint made by the Southern Railway to the Deptford Borough Council, and the council's acceptance of the situation, it may be of interest—and possibly of use to other railway companies under similar conditions—if we say that by Section 35 of the Malicious Damage Act, 1861, it was, *inter alia*, made an offence "unlawfully or maliciously to make or show, hide or move any signal or light upon or near to any railway." Under Section 32 of the Offences Against the Person Act of the same year, almost the identical wording is again used, but whilst the former was aimed against the intent to obstruct, upset, overthrow, injure, or destroy any engine, tender, carriage, or truck using such railway, the latter Act widened the offence so as to cover the intention to endanger the safety of any person travelling or being upon such railway.

* * * *

### A New Long-Burning Signal Lamp

As it is well known that colour-light signals control the greater part of the London Area of the Southern Railway, it may be thought that the signals referred to in the above note are within that area and therefore of the colour-light type. That is not so, as those between Brockley and New Cross Gate are still semaphore signals. The necessary intensification of the lights has been secured by the provision of a special type of long-burning signal lamp, designed by the Lamp Manufacturing Company—now part of the Lamp Manufacturing & Railway Supplies Limited. Its principal feature is an enlarged oil burner, giving an intense white light, used in conjunction with a highly

polished optical lens. The news of this application of a long-burning lamp is of particular interest to us, as about two years ago we were impressed by the brilliancy of the light given in daylight by an oil-burning lamp in a signal at the west end of Wimbledon station. The lamp, we were informed, was under test, and as those now under review are of the same pattern it would seem that further progress has been made in the important question of the illumination of signals.

* * * *

**Stalled on the Crossing**

The universal rise in the volume of road traffic has occasioned increasing anxiety over the problem of level crossings, which are to be found in large numbers in some countries. Abolition of the crossings would remove the problem, but as that is not likely to be accomplished for many a year yet, if it can ever be done entirely, the question of safety at such places remains one of pressing importance. Where there are proper gates, or barriers of an effective kind, closed in good time against road traffic, the danger comes from careless motorists who drive through them, even in broad daylight. The number of instances of this which have occurred in all countries shows how much negligence there is on the roads today. At unattended crossings there is the even greater danger of the road vehicle becoming stalled on the way over or stopping while the further side gates are being opened, as has been known to happen. If the vehicle cannot be restarted the driver is practically powerless to do anything. He is not provided with signal flags or lamps and, in any case, cannot run both ways at once. Should a train come along an accident is all but inevitable. The question will have to be faced sooner or later, and we understand that in Germany means of using automatic train control equipment for this purpose are now being investigated.

* * * *

**Railway Carriage Windows with Zip Fasteners**

Whilst travelling recently between Nuremberg and Cologne, in a Budapest to Hook of Holland FD express, we noticed that the doors of the compartment on the corridor side were fitted with windows made to open and close by the Zip method. Although not conforming exactly with the well recognised principle, the mechanism was substantially the same as that nowadays utilised for a variety of other purposes. The movement of the windows was effected by means of small finger triggers at each side. The mechanism appeared to be made of brass or similar material. A light pressure uniformly exerted on both sides sufficed to ensure quick and reliable action, and the window remained fixed in any position in which it was left. The coach was of Dutch manufacture and was of the standard side-corridor type of the Netherlands Railways, as used for long distance through express trains running in the international services. The window fittings were obviously very carefully planned, and there appeared to be nothing whatsoever to get out of order.

* * * *

**Systematic Maintenance of Permanent Way**

It is now three years since Mr. John Miller, the Engineer of the North Eastern Area of the L.N.E.R., put into operation throughout his area what has come to be known as the systematic maintenance of permanent way, and any one fortunate enough to be able to make an inspection of the permanent way under Mr. Miller's supervision would find evidence that the system was working well. In this issue we reproduce the calendar for 1935 issued by Mr. Miller to all the permanent way gangers and inspectors under him, and from it readers will be able to gain an idea of the thoroughness with which the scheme has been worked out. There are varying opinions as to the merits of operating a system of this sort, but for ourselves we consider that, properly administered, it need not interfere with individual initiative. On the other hand it has the very decided merit that the ganger whose initiative and organising ability are not of a high order is given definite guidance as to the best method of arranging his work. That Mr. Miller's maintenance costs are as low as any in the country may be added to the physical evidence in favour of his system.

* * * *

**Modern French Locomotives**

In this issue will be found details of modifications made to standard Est express locomotives to increase their overall efficiency, and some notes of their performance in service. The modifications follow along the lines originally laid down by the Paris-Orleans Railway, although they do not go quite so far. It will be recalled that the latter company's undistinguished Pacific locomotives, 25 to 30 years old, have been transformed into probably the most efficient locomotives in the world as a result of (1) improving the boiler by (*a*) increasing the pressure from 232 to 290 lb. per sq. in., (*b*) fitting a Nicholson thermic syphon and a shaking grate to the firebox, and (*c*) installing a Houlet superheater (described on page 332) to give a steam temperature of 400° C. (752° F.); (2) providing very large, direct steam and exhaust passages in conjunction with new cylinders having large O.C. poppet valves and the Kylchap double blast, thus minimising wire drawing and back pressure; (3) installing feed water heating apparatus; and (4) replacing the trailing wheels in certain of the engines by an extra pair of coupled wheels. The result has been almost to double the power of the locomotives, from about 2,000 i.h.p. formerly to a present maximum of 4,000 i.h.p. The power of the Est locomotives has gone up by about 50 per cent., and of the modified Etat and P.L.M. Pacifics roughly about 30 per cent. The smaller increases in the Est, Etat, and P.L.M. locomotives are due to the less comprehensive, and therefore presumably cheaper, modifications, but are none the less remarkable, and serve to show what performance improvement can be achieved by the close study of detail.

* * * *

**Locomotive Boiler Tubes Discussed**

On page 931 of THE RAILWAY GAZETTE dated December 7, 1934, reference was made to a paper read before the Institution of Locomotive Engineers by Mr. G. H. H. Collins on "The Manufacture and Repair of Locomotive Boiler Tubes." In opening the discussion on this subject, the President, Mr. H. N. Gresley, said that he was much more familiar with the use of tubes than with the process of making them. All locomotive engineers were, however, greatly indebted to the manufacturers for the perfection to which they had brought the tubes of today, particularly as compared with the steel tubes of many years ago. Mr. Gresley mentioned the author's statement that when flue tubes on the Great Western Railway were taken out, they had the screwed portion at the end removed, and that this could be done three times before the end of the tube was, as it were, closed up again to form a new screwed portion. His own experience was that when a screwed tube had had three runs in the boiler it was so pitted, even in districts where the water was pure and free from scale, that it was not worth doing anything more to it. For a tube to go out more than three times was very rare.

XUM

## The London Passenger Pooling Scheme

AS the result of lengthy negotiations, the Standing Joint Committee, set up under Section 31 of the L.P.T. Act, 1933, has now prepared its pooling scheme for London area passenger receipts. This has received the approval of the parties concerned and is therefore submitted as an agreed scheme to the London Passenger Transport Arbitration Tribunal for confirmation. For 21 days it is available for inspection at the offices of the tribunal, Columbia House, Aldwych, and during this period written representations with respect to its details may be made to the tribunal and to Mr. I. Buchanan Pritchard, Chief Legal Adviser and Solicitor, L.N.E.R., who is acting on behalf of the parties to the scheme. Naturally the main interest attaches to the proportions in which the parties are to participate in the pooled receipts, and inspection of the deposited scheme shows these to be as follow:—

| | Per cent. | | Per cent. |
|---|---|---|---|
| L.P.T.B. .. | 62·87900 | L.N.E.R. .. | 5·80557 |
| G.W.R. .. | 1·11332 | S.R. .. .. | 25·45464 |
| L.M.S.R. .. | 4·74747 | | |

The 37·12100 per cent. thus allocated to the main line railways also includes their shares in any joint committees, as it has been agreed that the whole of the shares of the parties to this scheme interested in any joint line shall be attributed for convenience of accounting to one or other of such parties, who will account and make the necessary settlements in respect of such joint lines. Furthermore, it is provided that, in so far as the calculations of the proportions may have rendered necessary some modification or variation of any agreement or arrangement (including any statutory provisions relating thereto) between any of the parties, or affect any joint line or joint operation, such agreement or arrangement (including statutory provisions) shall be modified accordingly. The calendar year 1932 was selected as the standard year, and the proportions set out above have been ascertained on the basis of the results of the passenger receipts for that period, but with equitable adjustments in respect of capital which had not become fully remunerative as at July 1, 1933, and of other factors which had not been fully reflected at that date in those results. It will be recalled that, when the L.P.T. Bill was before Parliament, the Ministry of Transport arranged for statistics to be prepared for one month (May, 1932) of the journeys of passengers between stations within an area corresponding generally to the London Passenger Transport Area. These figures, which were published with the Railway Statistics for August of that year, were reproduced in our issue dated February 10, 1933. In that issue we also outlined the general directions of the Act of 1933 as to the basis of the pool.

Briefly, the scheme is to apply to the whole of the passenger receipts, less operating allowances: (*a*) of the L.P.T. Board, including those arising from any joint line or from contract carriages; and (*b*) of each of the amalgamated railway companies attributable to the conveyance of passengers on journeys between any two stations on any suburban line or lines. Suburban lines are defined as so much of any railway owned or worked over by any of the amalgamated railway companies or of any joint line as lies within the London Passenger Transport Area or as lies outside that area and provides an alternative to a route on which a passenger service provided by the L.P.T. Board (otherwise than by a permitted working agreement with an outside bus operator) is being or might lawfully be operated. A comprehensive map of the areas affected by the L.P.T.B. was published on page 693 of our issue of May 26, 1933, and in referring to this it should be borne in mind that the area affected by the present pooling scheme, which is retrospective to July 1, 1933, when the L.P.T.B. began its operating existence, is the whole L.P.T. Area and not only the Special Area in which monopoly powers are exercised. It therefore extends southward to Guildford, Horsham, Three Bridges, and Edenbridge; eastward to Gravesend, Brentwood, and Ongar; northward to Bishop's Stortford, Baldock, and Luton; and westward to Wendover, High Wycombe, and Slough.

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## Great Western Railway

NOTWITHSTANDING the continued trade depression in South Wales, the gross railway receipts of this company for the year 1934 showed an increase of £717,379 or 2·92 per cent. Expenditure was at the same time kept well in hand and advanced only £248,230 or 1·23 per cent., bringing the operating ratio down from 81·81 per cent. to 80·47 per cent. Net railway receipts improved accordingly by £469,149 or 10·5 per cent. On ancillary businesses as a whole there was a net profit of £29,848, against a net loss of £17,091 in 1933. This improvement was mainly due to an increase of £22,642 in dock net receipts, and to a reduction of £25,104 in the loss on collection and delivery of parcels and goods. The loss on air transport was reduced from £6,526 to £5,150. Road transport goods services brought in £67,562 against £63,124, and road passenger services, which had receipts of £2,252 in 1933, no longer appear in the accounts. From "J" Joint Lines the net revenue was £1,141 less. Miscellaneous receipts, were, however, £83,933 higher, mainly because the dividends from associated omnibus undertakings rose from £69,276 to £121,570, and the return on the new investment of £545,794 in Carter, Patersons and Hay's Wharf Cartage amounted to £24,132. Net revenue for the year, at £5,410,999, comes out £582,438 higher and represents 3·19 per cent. of receipts from capital issued, as compared with 2·85 per cent. for 1933. Results for the past three years are compared in the accompanying table:—

| | 1934 £ | 1933 £ | 1932 £ |
|---|---|---|---|
| Total expenditure on capital account .. .. | 183,685,192 | 182,504,569 | 181,084,289 |
| Gross receipts from businesses carried on by the company .. .. | 29,280,382 | 28,423,656 | 28,462,343 |
| Revenue expenditure on ditto .. .. .. | 24,311,381 | 23,970,743 | 24,430,291 |
| Net receipts of ditto .. | 4,969,001 | 4,452,913 | 4,032,052 |
| "J" Joint Lines—company's proportion of net revenue .. .. .. | 130,638 | 131,779 | 127,661 |
| Miscellaneous receipts (net) | 1,069,264 | 985,331 | 1,024,686 |
| Miscellaneous charges .. | 757,904 | 741,462 | 724,996 |
| Net revenue .. .. | 5,410,999 | 4,828,561 | 4,459,403 |
| Profit on realisation of investments .. .. | 323,948 | 71,529 | 605,927 |
| Interest on loans and debenture stocks .. .. | 1,649,809 | 1,619,809 | 1,549,804 |
| Dividends on rent charge, guaranteed and preference stocks .. .. | 3,344,699 | 3,344,699 | 3,347,118 |
| Balance after payment of preference dividends .. | 740,439 | Dr. 64,418 | 168,408 |
| Dividend on ordinary stock | 1,287,892 | 1,287,892 | 1,287,892 |
| Rate per cent. .. .. | 3 | 3 | 3 |
| Deficit .. .. .. | 547,453 | 1,352,310 | 1,119,484 |
| Appropriation from Contingency Fund .. .. | 550,000 | 1,350,000 | 400,000 |
| Transfer to General Reserve Fund .. .. | — | — | 700,000 |
| Balance brought forward from previous year .. | 40,679 | 42,989 | 62,473 |
| Balance carried forward to subsequent year .. | 43,226 | 40,679 | 42,989 |

Ordinary passengers (including workmen) originating on the company's system numbered 96,014,615, an increase of 1,705,301 or 1·81 per cent., and the receipts from ordinary passengers were £7,007,878, an increase of £92,316 or 1·33 per cent. Of these originating passengers only 0·83 per cent. were first class, but first class receipts (including season tickets) were 6·88 per cent. of the total receipts from passengers. First class ordinary passenger receipts were up £11,831, but first class seasons were down £5,895. Parcels, mails, &c., brought in £1,958 more, and total passenger train receipts amounted to £10,569,140, an increase of £92,327, and represented 41·79 per cent. of the gross railway receipts compared with 42·64 per cent. in 1933. From higher class merchandise the receipts were £6,885,429, an increase of £295,476 or 4·48 per cent., and the originating tonnage of this class advanced by 5·23 per cent. Minerals and merchandise (classes 1—6) brought in £2,221,698, a gain of £245,072 or 12·40 per cent., with an increase in originating tonnage of 12·82 per cent. Coal, &c., receipts were £5,192,238, an improvement of £78,718 or 1·54 per cent., with an advance in originating tonnage of 2·26 per cent. Goods train receipts as a whole were £14,500,385, a net increase of £611,974, and represented 57·34 per cent. (against 56·52 per cent.) of the total railway receipts. The accompanying table shows the approximate allocation of receipts in 1934:—

| | Amount £ | Amount per £ s. | d. |
|---|---|---|---|
| Salaries and wages .. .. .. | 16,250,000 | 11 | 1 |
| Coal .. .. .. .. .. | 1,750,000 | 1 | 2 |
| Other material .. .. .. | 3,250,000 | 2 | 3 |
| Rates and sundry items, *less* miscellaneous receipts .. .. | 2,600,000 | 1 | 10 |
| | 23,850,000 | 16 | 4 |
| Appropriation from reserves, &c. .. | 850,000 | | 7 |
| | 23,000,000 | 15 | 9 |
| Interest and dividends on capital .. | 6,250,000 | 4 | 3 |
| | 29,250,000 | 20 | 0 |

In 1933 salaries and wages got 11s. 3d. in the £, whereas interest and dividends received 4s. 4d., but only with the aid of 11d. from reserves, &c. Engine miles increased by 3·24 per cent., and in train-miles there was an increase of 2·81 per cent. under coaching and of 4·14 per cent. under goods. In the circumstances an increase in locomotive running expenses from £4,820,180 to £4,862,262 and in traffic expenses from £6,967,538 to £7,049,286 shows no lack of economical operation. The charge against maintenance of way and works was £68,148 more, and the length of track renewed was 265½ miles against 251¾ miles in 1933. Renewal funds were utilised to the extent of £102,338, against £289,068. For maintenance of rolling stock the sum charged in the accounts is £3,135,572, an increase of £50,220, and renewal funds were utilised to the extent of £152,543. Some 106 locomotives were renewed in the company's shops at a cost of £283,179. Of coaching vehicles there were 246 renewals (against 170 in 1933) and these cost £370,648, and there were renewals of 2,504 merchandise and mineral vehicles (against 1,414 in 1933) at a cost of £277,265.

Notwithstanding a further withdrawal from reserves, &c., for the payment of dividends, the balance sheet shows a very strong financial position. By the transfer to the contingency fund of certain reserves for special purposes, which are no longer required, the net reduction in the contingency fund is only £39,581, and the profits of the year were sufficient to pay £740,439 out of the £1,287,892 required for the ordinary dividend. Investments in Government securities total £10,010,318. The extensive programme of works under the Development (Loan Guarantees and Grants) Act, 1929, is now approaching completion, and the schemes finished during the year were the reconstruction of Cardiff General station, and the quadrupling of the line between Dr. Day's Bridge junction and South Wales junction, Bristol. Capital expenditure during 1934 amounted to £1,180,623 (including £22,349 for 4 diesel railcars), and for 1935 is estimated at £475,000, including £37,000 for diesel railcars. The net annual value published by the Railway Assessment Authority in its draft valuation roll of the Great Western undertaking is £2,800,000, but this figure is regarded by the company as excessive.

* * * *

## London Midland & Scottish Railway

AFTER the drastic reductions in expenditure during the past few years some advance in working costs was bound to result in 1934 because of the considerable increase in traffic. Gross receipts from railway working amounted to £60,571,587, an increase of £2,386,148, or 4·11 per cent., but in the railway working expenses of £49,563,211 the advance was not more than £1,339,451, or 2·77 per cent., and the operating ratio declined from 82·88 per cent. to 81·83 per cent. Some 13,286,646 more passengers and 8,575,928 more tons were carried, so it is not surprising that transportation expenses (locomotive running and traffic) at £29,949,423, showed an increase of £686,240, or 2·34 per cent., though their percentage to total receipts was reduced from 50·29 to 49·44. To maintenance of way and works £279,262 more was charged, and to maintenance of rolling stock £277,808 more.

Net railway receipts were £11,008,376, an improvement of £1,046,697. From ancillary businesses the profits were £247,387 net, an increase of £103,037 on 1933. In road transport there was an improvement of £10,711 net. To the gross receipts passenger road services contributed £208,703 (against £188,992) and road goods services £139,147 (against £123,757). Steamboat profits were £228,577, an increase of £44,924, and the net earnings of the hotels department were £363,175, an improvement of £76,467. The loss on docks was reduced from £64,879 to £14,359, but that on collection and delivery was increased from £301,306 to £382,706. Net revenue from "J" Joint lines improved by £3,332. Among the miscellaneous receipts the dividends from omnibus undertakings advanced from £205,749 to £230,197, and the income from the road motor goods carrying undertakings of Joseph Nall & Co. Ltd. and Wordie & Co. Ltd. was £4,500, against £3,023. From David McBrayne Limited the income was unchanged at £6,875. The loss on the Northern Counties Railway (Ireland) was reduced from £82,451 to £38,425.

Receipts from railway passengers in 1934 totalled £18,236,721, an increase of £428,698 or 2·40 per cent. First class ordinary passengers increased in number by 24,017, but brought in £2,625 less, and first class season receipts were down £51,389. Nevertheless, first class receipts represented 9·2 per cent. of the total passenger receipts. Parcels, &c., and mails brought in £6,503,243, an increase of £30,397. From goods train traffic £35,235,597 was received, an increase of £1,895,435 or 5·68 per cent. Receipts from higher class merchandise were £17,320,421, an increase of £827,326, but the average receipt per ton fell from 13s. 5·48d. to 13s. 1·84d. Similarly, the average receipt per ton from minerals and other merchandise fell from 4s. 3·49d. to 4s. 1·19d., although the total receipts rose from £4,665,001 to £5,308,222. Coal class receipts amounted to £12,039,242,

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an increase of £439,878, with an average receipt per ton of 3s. 4·03d. against 3s. 4·01d.

The accompanying table shows the general financial position compared with the two preceding years :—

| | 1934 | 1933 | 1932 |
|---|---|---|---|
| | £ | £ | £ |
| Total expenditure on capital account .. | 452,554,778 | 452,974,229 | 453,037,579 |
| Gross receipts from businesses carried on by the company .. .. | 68,180,325 | 65,291,119 | 65,496,079 |
| Revenue expenditure on ditto .. .. .. | 56,924,562 | 55,185,091 | 56,318,696 |
| Net receipts of ditto .. | 11,255,763 | 10,106,028 | 9,177,383 |
| "J" Joint Lines—company's proportion of net revenue .. .. .. | 57,306 | 53,974 | 22,677 |
| Miscellaneous receipts (net) | 2,331,358 | 2,266,839 | 2,404,799 |
| Miscellaneous charges .. | 1,723,191 | 1,714,156 | 1,700,036 |
| Net revenue .. .. | 11,921,236 | 10,712,685 | 9,904,823 |
| Interest on debenture stocks .. .. .. | 4,439,171 | 4,439,171 | 4,439,171 |
| Dividends on guaranteed and preference stocks .. | 7,521,200 | 6,213,860 | 5,558,696 |
| Balance after payment of preference dividends .. | Dr. 39,135 | 59,654 | Dr. 93,044 |
| Surplus or deficit, + or − | − 39,135 | + 59,654 | − 93,044 |
| Appropriation from contingency fund .. .. | — | — | 93,044 |
| Balance brought forward | 59,654 | — | — |
| Balance carried forward .. | 20,519 | 59,654 | — |

The length of track maintained during 1934 was 531¼ miles, against 521¾ miles in 1933. The number of locomotive renewals was 217, of which 127 were in the company's shops and 90 by contractors, the amounts charged to maintenance for complete renewals being respectively £668,844 and £497,991. Renewals of coaching vehicles were 1,090, of which 970 were in the company's shops and 120 by contractors, the respective amounts charged to maintenance for complete renewals of coaching vehicles being respectively £1,225,093 and £240,861. Merchandise and mineral vehicle renewals were 7,688, of which 5,688 were in the company's shops and 2,000 by contractors, and the amounts charged to maintenance for renewals of vehicles of this class were respectively £663,588 and £342,144. In the summarised report presented by the directors it is mentioned that the provisional net annual values of the company's railway, dock and canal property in England and Wales are given in the draft roll issued by the Railway Assessment Authority as £5,000,000 or approximately £1,300,000 greater than the valuations at March 31, 1931. The necessary representations against these provisional valuations will be made and substantial reductions from the old valuations will be claimed.

* * * *

## Southern Railway

SHAREHOLDERS have every reason to be satisfied with the 1934 report and accounts of the Southern Railway, which is the only one of the four group companies to earn fully the dividend declared on ordinary capital. Though the amount required to pay the increase in dividend on the preferred ordinary stock from 3 to 4 per cent. requires £275,866 more, the carry forward is £2,426 greater. The increase of £523,070 in receipts from railway working was accompanied by an increase of only £252,527 in railway working expenditure, so that net railway receipts (£4,298,415) improved by £270,543. Net receipts from ancillary businesses as a whole were, however, £22,900 lower, at £454,959. Steamer net receipts were £3,905 higher, but dock net receipts were £1,513 lower although gross receipts were up. Road transport net receipts improved by £752, but the profit on collection and delivery of parcels and goods was reduced from £60,520 to £42,856, and on canals from £1,206 to £357, and the loss on the three hotels which the company works, namely Deal (South Eastern), Charing Cross, and Craven, was increased from £588 to £3,349. On the new service of "Air Transport" there was a net loss of £4,770, with gross receipts of £272. The share of loss on the Somerset & Dorset joint line was increased by £3,726, but miscellaneous receipts showed an improvement of £24,111, due mainly to a new item "interest and dividends from investments in other undertakings" representing dividends of £24,127 from the £545,726 subscribed to Carter, Paterson & Co. Ltd. and Hay's Wharf Cartage Co. Ltd. Miscellaneous charges are up £7,490, and the net revenue for the year is £260,538 higher. Results are compared in the accompanying table:—

| | 1934 | 1933 | 1932 |
|---|---|---|---|
| | £ | £ | £ |
| Total expenditure on capital account.. .. | 166,064,274 | 164,336,509 | 163,139,152 |
| Gross receipts from businesses carried on by the company .. .. | 23,152,749 | 22,598,417 | 22,329,065 |
| Revenue expenditure on ditto .. .. .. | 18,399,375 | 18,092,686 | 18,349,392 |
| Net receipts of ditto .. | 4,753,374 | 4,505,731 | 3,979,673 |
| "J" Joint Lines—company's proportion of net revenue .. .. .. | Dr. 49,432 | Dr. 45,706 | Dr. 47,766 |
| Miscellaneous receipts(net) | 1,326,479 | 1,302,368 | 1,181,450 |
| Miscellaneous charges .. | 230,086 | 222,596 | 219,248 |
| Net revenue .. .. | 5,800,335 | 5,539,797 | 4,894,109 |
| Interest on loans and debenture stocks, &c. .. | 1,943,167 | 1,943,167 | 1,753,167 |
| Dividends on guaranteed and preference stocks.. | 2,751,278 | 2,751,278 | 2,751,278 |
| Balance after payment of preference dividends .. | 1,105,890 | 845,352 | 389,664 |
| Dividend on preferred ordinary stock .. .. | 1,103,464 | 827,598 | 275,866 |
| Rate per cent. .. .. | 4 | 3 | 1 |
| Surplus .. .. .. | 2,426 | 17,754 | 113,798 |
| Balance brought forward from previous year .. | 224,927 | 207,173 | 93,375 |
| Balance carried forward to subsequent year .. | 227,353 | 224,927 | 207,173 |

Passenger train traffic produced £15,164,250, or £296,574 more than in 1933, and represented 74·45 per cent. of the total railway receipts of £20,368,894. Passengers brought in £12,917,221, an increase of £281,625. First class represented 1·59 per cent. of the total of ordinary passengers, and produced 7·68 per cent. of ordinary passenger receipts, but, including season tickets, first class brought in 10·1 per cent. of the total passenger revenue. Second class boat train passengers yielded £4,518 more. In parcels, mails, &c., there was an improvement of £14,948. Goods train receipts amounted to £4,967,676, an increase of £214,742, with an increase in tonnage of 615,968. For the railway the operating ratio was reduced from 79·70 per cent. to 78·90 per cent., though there were increases under each of the five main abstracts. Electric motor vehicle miles rose from 25,647,592 to 25,947,081 and steam engine miles from 51,534,757 to 52,802,985. Capital expenditure during the year amounted to £1,727,765 net, the chief items being £644,061 on electrification, £549,203 on dock extensions at Southampton, and £545,726 on the Carter, Paterson and Hay's Wharf purchase.

It is announced in the report that the construction of a railway from Motspur Park to Church Lane, Chessington (about 4 miles in length), part of the railway authorised in 1930 from Motspur Park to Leatherhead, will be commenced shortly. This railway will be equipped for electric train services, and it is proposed to provide stations at or near Old Malden, Tolworth, Moor Lane (Chessington), and Garrison Lane (Chessington). Fuller particulars and a map of the scheme will be found in our News Section. The reconstruction of Southampton West station is well in hand, and a widening to four lines of

way is being carried out between that station and Millbrook. The latter station is also being reconstructed and a double line connection made with the docks extension at Southampton. The branch line to Allhallows on the Kent Coast has been doubled in order to deal with the increased passenger traffic carried during the summer months. Amongst other improvements are a new goods station at Fratton to take the place of the existing depot adjoining Portsmouth Town station, and a modern warehouse at Nine Elms to replace the existing warehouse which is not capable of accommodating the traffic offered. Carriage washing plants are being installed at Selhurst, Orpington, and Slades Green. Construction of the dock at Dover, in connection with the proposed Dunkirk train ferry service, is progressing, but owing to unforeseen difficulties, the work cannot be completed within the period originally contemplated. Two of the three train ferry vessels ordered for this service have been delivered after successful trials. It is proposed to extend the electrification in the London suburban area from Woodside junction (near Croydon) to Sanderstead (3¼ route miles).

* * * *

## Charles Hubert Stemp

A NOTABLE railway career will be brought to a close next month by the retirement of Mr. Charles Hubert Stemp, C.B.E., who, since 1916, has been in charge of the operation of the system then known as the North British Railway and, since 1923, as the Southern Scottish Area of the London & North Eastern group. Over fifty years ago Mr. Stemp started at the bottom of the ladder on the former Great Eastern Railway, but so rapidly did he assimilate the essentials of efficient operation, that within twelve years he had risen to be a Chief Assistant District Officer. His outstanding ability was soon recognised at headquarters, where he was selected for special traffic working duties. Subsequently, when a competent operating officer was required on the North British Railway, Mr. Stemp's success on the Great Eastern earned for him so strong a recommendation that he was appointed Traffic Assistant to the Superintendent of the Line in Edinburgh.

His appointment was quickly justified by the great improvements he effected in North British time-keeping, general organisation and signalling, and his introduction of traffic control probably contributed more than anything else to the running improvements with which Mr. Stemp's name will always be associated. During the war, when the North British was the secretarial company in Scotland for all mobilisation arrangements, movements of naval and military forces and supplies, Mr. Stemp was the officer responsible for them on behalf of the company. His services received special recognition on several occasions at the hands of the King, both officially—in distinctions culminating in the C.B.E.—and personally. Mr. Stemp's retirement will remove from the active list one of the strongest personalities and ablest operating officers in the country, and he will carry with him into retirement the best wishes of a host of friends and admirers. A portrait and brief outline of Mr. Stemp's career will be found on page 343.

# LETTERS TO THE EDITOR

(*The Editor is not responsible for the opinions of correspondents*)

## Impressions of Overseas Transport

The Baltimore & Ohio Railroad Company,
Public Relations Department,
Baltimore, Md. February 6

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—I have just read Chapter IX of the story "Impressions of Overseas Transport," by Mr. A. W. Arthurton, which appears on page 135 of your issue of January 25. In third from the last paragraph the author refers to "The Pennsylvania Company's Union Station at Washington." The Union Station in Washington is owned one-half by the Baltimore & Ohio Railroad Company and one-half by the Pennsylvania Company. It is operated by the Washington Terminal Company, which company is under the direction jointly of the Baltimore & Ohio and the Pennsylvania.

In next to the last paragraph, the author describes the Liberty Limited as the fastest train from Washington to Chicago. The Liberty Limited leaves Washington at 4.10 p.m. and arrives in Chicago at 8.30 a.m., the running time, allowing for the extra hour caused by change of time between the two points, being 17 hr. 20 min. The Capitol Limited of the Baltimore & Ohio leaves Washington at 4.25 p.m., and arrives in Chicago at 8.35 a.m., making the run in 17 hr. 10 min., or ten minutes faster than the Liberty Limited.

Furthermore the Capitol Limited is the only all-Pullman train operating between Washington and Chicago and, in addition to the service features ascribed to the Liberty Limited, has a train secretary whose services are at the disposal of patrons of the train without charge. The Capitol Limited was the first completely air conditioned train to operate between Washington and Chicago, having been first operated with this new development in 1932. The Liberty Limited was air conditioned in 1934. Credit for pioneering in air conditioning is very generally given to the Baltimore & Ohio, since we operated the first air conditioned car in 1930, the first completely air conditioned train, the Columbian, in 1931, and the first fully air conditioned sleeping car train, the National Limited, between Washington and St. Louis, in 1932, followed shortly thereafter by the Capitol Limited, as noted.

We would be pleased, of course, if you could publish these corrections in a forthcoming issue.

Yours very truly,
ROBERT M. VAN SANT,
*Director*

## Mechanics of a Locomotive on Curved Track

Chinthurst Lodge,
Wonersh, Guildford.
February 14

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—For detailed and careful reading I have been saving up the articles on the curving of railway vehicles by the late Mr. Porter until they may be read and studied as a whole. In glancing through the instalment in your issue of February 8, however, I feel called upon to make the comment that the author has calculated the modified weights on the wheels of an engine running at 60 m.p.h., and the rise in the main frame, without taking into consideration the frontal air pressure and the upward stress on the slide-bars, omissions which invalidate all the figures.

Yours truly,
C. F. DENDY MARSHALL

[To attempt to take such an extremely variable factor as wind resistance into consideration would, we suggest, unwarrantably complicate the matter. We think, however, that a careful reading of the late Mr. Porter's paper will show that the second factor mentioned by Mr. Dendy Marshall was actually taken into account.—ED., *R.G.*]

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# PUBLICATIONS RECEIVED

**Engineering Inspection, Vol. I, No. 1.**—This is the official organ of the Institution of Engineering Inspection, which was founded 16 years ago in the interests of inspectors in every description of professional, manufacturing and constructive engineering, including its branches of chemistry and metallurgy. If the standard of this first issue is maintained, the publication should prove a useful one. Under the title "The Engineer as Planner" Dr. Victor Cofman writes an article which deserves to be widely read. He refers to the necessity to make proper use of the accumulated knowledge which now enables humanity not only to produce plenty, but also to ensure its maintenance. At the present time, as he points out, the main factor which limits the use of this productive capacity is lack of "purchasing power" in the hands of those who could use it. He groups people generally into those with a "plenty" outlook and those with a "scarcity" outlook. The latter outlook is held, as he says, by persons devoid of imagination who see only the relatively small present surplus of stock and fail to visualise the potentialities of planned production, and those who think it is good for humanity to work hard for its bread rather than to enjoy the fruits of plenty and leisure. On the other hand, the engineer is outstandingly a "plenty" man. This is the sort of article that engineers would do well to take to heart.

**Swiss Federal Railways Calendar.**—The possibilities of the calendar as a medium of advertisement are excellently demonstrated in that published by the Swiss Federal Railways for 1935. It is available to the public at a price of 2 francs, and since each week appears on a separate and attractively illustrated tear-off page dealing with some form of railway activity, it achieves much that is otherwise hard to attain in publicity media. A twelve month's period of currency, a constantly changing message and an assured place in the routine of daily life, are factors which demand respect for the advertising calendar, and the Swiss Federal Railways authorities have selected the pictures and letterpress for the present example with a care which shows their realisation of its potentialities. Before particularising upon the subjects shown, it should be remarked that in the composition, lighting and posing of the illustrations there is evident that sense of the camera which alone can make a photograph a picture. Many of the pages emphasise travel facilities, such as cheap tickets, reservation of seats, special trains for winter sports devotees and their paraphernalia, and the like, but others show the technical side of railway operation and maintenance, with a proper insistence upon the thought paid to safety which should, but probably will not, bring a blush to the cheeks of certain motorists. The examination of graphical records of locomotive running produced by the sealed speed recording apparatus, forms the subject of one such sermon, and the sums which the railways themselves have to set aside for the maintenance of the permanent way provide another. Beneath a picture of a motor lorry delivering goods is the following paragraph: "If the sovereign people so desires, the law for the sharing of traffic will put an end to the anarchy at present rampant in the sphere of goods transport. To the economic welfare of the public as a whole, it will ensure rationalised, swifter and cheaper carriage of consignments by rail and road. This measure is an indispensable condition for the urgent financial rehabilitation of our State railways."

**Henschel Lokomotiv-Taschenbuch, 1935** (Henschel Locomotive Pocket Book, 1935). Kassel: Henschel & Sohn A.G.; and Berlin, Julius Springer. 6 in. by 4½ in. 284 pp. 227 figs. 7 RM.—The appearance of this useful reference book marks fittingly the opening of a year in which there will be celebrated the centenary of the railway in Germany and the 125th anniversary of the foundation of the Henschel works. Since the construction of the *Drache* in 1848, the firm of Henschel has been associated with every stage in the development of German locomotive practice, and though direct reference to the firm is practically restricted to the first few pages of this pocket book, in the form of an analysis of the scope and nature of its products, the body of the work is copiously illustrated by representative Henschel steam locomotives of all types, from powerful express down to small shunting and industrial locomotives, and, in addition, a number of electric locomotives and railcars. Carefully selected and excellently reproduced, these illustrations are useful for reference purposes, particularly as they are supplemented by tabulated leading dimensions and thoroughly indexed and cross-referenced. Among the latest developments illustrated, special interest attaches to the streamlined 4-6-4 locomotive designed for the German State Railway, for hauling four-coach trains at speeds up to 105 m.p.h.; and to the Henschel patent condensing locomotive, the layout of which is shown very clearly.

The inclusion of these and other particulars concerning the firm's practice adds materially to the value of the book, most of which is devoted to technical notes and tables useful to designers and railway engineers. The contents include a schedule of German regulations concerning the construction and operation of locomotives; track gauges, axle loadings, and structural profiles; formulæ, curves and numerical data for locomotive design, supplemented by special sections on boilers, motion work, balancing, valve gear, frames, brakes, and so on, making about 150 pages of remarkable value; and a very useful collection of mathematical, mensuration, tolerance, and other tables. The book is clearly and concisely presented, and will command attention wherever there are railways. An edition in English is to be published during the year.

**Outdoor Terminal Boxes.**—British Insulated Cables Limited, Prescot, Lancs, sends a descriptive leaflet of a new range of outdoor terminal boxes for working pressures from 3·3 kV to 11·0 kV. The units are of the inverted type, with fixing feet arranged for wall, cross arm or pole mounting. The protection afforded against weather effects is very complete and the factor of safety is such that the boxes can be installed with confidence in situations where the insulators are liable to fouling by smoke, fumes, or other causes.

**Drop Forging Achievements.**—The English Steel Corporation Limited has issued an illustrated brochure enumerating the record achievements on land, air, and water in which the company's steels and drop-forged crankshafts have been used. Further interest is lent to the booklet by the fact that a crankshaft manufactured at the Vickers works, Sheffield, is fitted to Sir Malcolm Campbell's *Bluebird*, in which he will attempt to break his own existing land speed record, and that similar equipment has been used by him since 1927. No less of a testimonial to the English Steel Corporation's products than such high-speed performances are the numerous long-distance flights with which the concern has been associated through its manufactures, including seven between England and Australia and four transatlantic journeys.

**Superheaters.**—The applications of superheated steam in the public utility, industrial, and marine fields are comprehensively described in this illustrated booklet published by the Superheater Co. Ltd., Bush House, W.C.2. The advantages of superheating are outlined in the introductory pages, after which the construction of Melesco superheaters is briefly described. A characteristic and exclusive feature is forged return bend, multiple loop assembly, whereby elements of any length, and entirely free from joints in the path of high temperature gases, may be fabricated. The major part of the book shows in picture and diagram the installation of Melesco superheaters in large-scale steam generating plants. Among these may be mentioned the Neasden power station of London Transport, where three Babcock and Wilcox boilers are so equipped, and give a maximum evaporation of 110,000 lb. an hour, with 280 lb. working pressure and 354° F. superheat. Superheaters for oil-fired boilers are also described. The concluding pages of the book show Melesco elements in feed-water heaters, air heaters, and miscellaneous forms of heat exchangers.

# THE SCRAP HEAP

Employer: "But, look here, these aren't testimonials."

Office Boy (applying for job): "No, sir, but I thought they would help. They're copies of the death certificates of my four grandparents."—*From the "L.M.S. Magazine."*

* * *

The following warning to railway travellers appeared in *The Morning Post* in November, 1838:—

"All persons travelling by railway are strongly recommended not to fix their eyes too intently on objects which they pass, as doing so is likely to prove both painful and injurious to those most delicate organs. This is especially urged to those who may have a tendency towards a determination of blood to the head as being likely to increase that tendency."

* * *

The fascination of railway trains for children remains strong as ever. Small children play trains far oftener than they play motor cars. The other day a poetic-looking little boy, scion of a very motoring house, confided to a favourite uncle the nature of the hitherto secret and rapturous games he played with a brother after they were in bed. "Sometimes," he said, with a look of ecstatic remembrance on his face, as though he heard the horns of elfland faintly blowing, "sometimes we pretend that I'm the manager of the Southern Railway."—*From "The Lady."*

* * *

NO HALF MEASURES

Lady (to restaurant car attendant): "I think I'll have an ice, please!"

R.C.A.: "Sorry, madam, we're not serving ices today—(hesitatingly), tea, coffee or cocoa?"

Lady: "Oh! Well, bring me coffee, please—will you see that the milk is *really* hot."

* * *

The "bride and groom" cars of the Pennsylvania Railroad are not, as might be supposed, luxurious conveyances for the honeymoon trips of the wealthy. The name is one given by trainmen to a special type of car, designed to meet the needs of local service in electrified zones, and intended to be operated in pairs. One car of each pair is a self-propelled unit, and the other a trailer. Twenty-three additional pairs are now under construction at the Altoona works for local service between Baltimore and Washington. Where the traffic requires longer trains, two or more pairs are connected. As to which car is the "bride" and which the "groom," Pennsylvania Railroad men will not commit themselves. It depends, apparently, on the answer to the question, which is the "head man" of a married couple?

Mr. Christopher M. Bussy, of Wandsworth Common, writes that to judge from the "rules for passengers" issued by the Lübeck-Büchen Railway Company, and reproduced in The Scrap Heap of January 4, the railway passenger the world over has the same vices. The rules, he says, would have made a pleasing retaliation by the railway companies to a similar set of "regulations" composed by *Punch* in 1846 and reproduced in "Mr. Punch's History of Modern England." The article ran as follows:—

The French Government has published a royal *ordonnance*, fixing the regulations that are henceforward to be observed by all the railway companies in working their lines. As it is a pity these things should be better managed in France, we publish a set of regulations for English railways. Lord John Russell is welcome to them if he likes.

Every passenger in the second and third class is to be allowed to carry a dark lantern, or a penny candle, or a safety lamp, into the train with him, as the directors have kept the public in the dark quite long enough.

No train is to travel slower than an omnibus, let the excursion be ever so cheap, or the occasion ever so joyful.

Cattle are to be separated from the passengers as much as possible, as it has been found, from experiments, that men and oxen do not mix sociably together.

No stoppage at a railway station is to exceed half an hour.

No railway dividend is to exceed 100 per cent., and no bonus to be divided oftener than once a month.

No fare is to be raised more than at the rate of a pound a week.

No third class carriage is to contain more than a foot deep of water in wet weather, but, to prevent accidents, corks and swimming belts should always be kept in open carriages.

The ladies' carriages are to be waited upon by female policemen.

Every tunnel must be illuminated with one candle at least.

Never less than five minutes are to be allowed for dinner or refreshment. (*Punch* was especially wroth with the "three minutes for scalding soup" at Wolverton.)

One director must always travel with every train, only he is to be allowed the option of choosing his seat, either in the second or third class—whichever of the two he prefers.

Hospitals are to be built at every terminus, and a surgeon to be in attendance at every station.

There must be some communication between every carriage and the stoker, or the guard, either by bell or a speaking tube, or a portable electric telegraph, so that the passengers may have some means of giving information when their carriage is off the line, or falling over an embankment, or a maniac or a horse has broken loose.

Mr. Bussy adds that there is, as Mr. Punch observes in his "History," sense as well as absurdity in this list, but it will be noted that while the passenger grievances have been removed through the enterprise of the railways, the passenger himself would seem to be as incorrigible today as he ever was and with less cause.

* * *

THE STANDEDGE TUNNELS

On the Scrap Heap page of August 24 last, we illustrated and gave brief details of the Standedge tunnels on the old L.N.W.R. route from Manchester to Leeds. A correspondent has now sent us the photograph reproduced below of the entrance to the canal tunnel which runs parallel to the L.M.S. railway tunnels but on a lower level. The canal tunnel is now disused, but is examined twice a year. The inspectors lie on their backs in a barge and propel themselves by kicking the tunnel roof; bargemen, of course, use this method—called "legging"—when taking dumb barges through tunnels without tow paths.

*Entrance to the Standedge canal tunnel which is parallel to the L.M.S.R. tunnels, but on a lower level*

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# OVERSEAS RAILWAY AFFAIRS

*From our correspondents*

## RHODESIA

### Improved Financial Results

The approximate revenue and expenditure figures for the Rhodesia Railways have been issued for the financial year ended September 30, 1934, and reveal a much improved position as compared with the previous year, though still considerably below the very satisfactory results obtained during the years 1927-1930. The comparative figures for the two years given below show that the territories served by the Rhodesia Railways are making a very definite recovery from the trade depression:—

| | Years ended September 30, 1934 | 1933 | Increase |
|---|---|---|---|
| | £ | £ | £ |
| Total earnings | 3,895,490 | 2,887,683 | 1,007,807 |
| Gross Operating expenses ... | 2,480,258 | 2,283,923 | 196,335 |
| Net operating revenue ... | 1,415,232 | 603,760 | 811,472 |

To obtain an increased revenue of just over a million pounds with an increase of only £196,335 in operating expenses is evidence of economical working, and the General Manager in a New Year message pays tribute to the continued co-operation of the staff in the interests of economy. The gold mining prosperity in Southern Rhodesia, coupled with the improvement in the output of base metals, has contributed materially to these improved railway results. Passenger traffic shows a slight increase in revenue, though there is a decrease in the number of third class and native passengers carried. The tonnage of coal and coke increased from 411,496 tons to 564,566 tons, and out of the increase of 153,070 tons the copper mines took 83,326 tons. The chrome ore traffic carried from the Southern Rhodesian mines increased by 41,874 tons and zinc from the Broken Hill mine by 6,676 tons. A decrease of 1,486 tons was recorded in asbestos traffic.

### Northern Rhodesian Copper Mines

Though the Belgian Congo contributes some of the copper traffic conveyed over the Rhodesia Railways for export via Beira, the greater proportion originates from the Northern Rhodesian mines. During the last financial year 187,434 tons of copper were carried, an increase of 59,255 tons or 46 per cent. The Mufulira Mine commenced production during the year and is likely to reach the full production stage towards the end of 1935, while the refinery at the Nkana Mine will come into operation very shortly. In an interview with the Capetown press on his return from overseas leave, Mr. H. Chapman, C.B.E., General Manager of the Rhodesia Railways, stated that there was considerable speculation in England as to whether there was likely to be any restriction in the copper output; he added that it was probable that an announcement upon this important matter might be expected soon. With the material increase in the heavy industries in England, Rhodesia could look forward hopefully to a steady increase in the use of copper.

## SPAIN

### The Railways and Protection

A deputation of the principal companies recently visited the Minister for Commerce and Industry, to protest against the intolerable burden thrown on their working expenses by the high prices arising out of the excessively high duties on imported materials and especially on fuel and lubricants.

### The "Madrid-Madrid" Railway

The Northern of Spain and the Madrid, Saragossa and Alicante Companies have presented a joint memorial to the Minister of Public Works on the subject of a Central station and connecting line between the existing Norte and M.Z.A. termini in Madrid, projected by the late Socialist Minister, Sr. Prieto. The companies have endeavoured to make it quite plain that they decline to accept responsibility for any consequences to which the scheme might give rise. They assure the Minister that the scheme can have no useful result, as the volume of traffic is insufficient to warrant the estimated outlay of 170 million pesetas. The traffic for which the new connection was designed is at present amply covered by a service of five trains a day in each direction on the existing connecting line, and the railway companies see no reason for altering this arrangement. Repeated attempts had been made to encourage this traffic by the introduction of through carriages, but the number of passengers had never proved sufficient to justify this action. A service of motor buses between the Norte and the M.Z.A. stations had also proved unremunerative. The memorial points out that if the work is continued, against their recommendations, the cost involved cannot rightly be considered as State capital contributed to the companies.

### Details of the Gibraltar Tunnel Scheme

According to *Ya*, the new Madrid daily, the preliminary investigations in connection with this project are now well advanced, and the cost is estimated at 300 million pesetas (about £8,500,000 at present rate of exchange): it is calculated that a period of three to four years would be required for the completion of the work. According to the present scheme, the tunnel will be some 32 km. in length, and will consist of two independent up and down main tunnels, and a third tunnel for drainage. The tunnels will be driven at a depth of from 70 m. to 100 m. below the sea bed, or about 400 m. below sea level. But for the fact that the depth on the shortest alignment across the straits is very much greater, the tunnel might have been considerably shorter. A special submarine apparatus is being constructed, with which it is hoped to make a detailed investigation of the conditions of the sea floor above the route proposed for the tunnel. As at present proposed, the tunnel would be constructed between Punta Peña, near Tarifa, on the Spanish side, and Punta Allares in Morocco. So great a cost as 300 million pesetas would seem to be an insuperable difficulty in the present state of the national finances, but it is argued that almost the whole of the money would be retained in the country in the form of payments for labour and materials of national production.

## INDIA

### A Great Hindu Festival

Sunday, February 3, was a great day for the Hindus, being the rare and sacred festival of *Ardhodaya Joga*. The astrological combinations that are necessary for this *Joga* occur but thrice in a century, and on such occasions devout Hindus foregather from distant parts of the land to have a dip in the holy waters of the Ganges. On February 3 it is estimated that over half a million pilgrims from various parts of Bengal, Bihar, and Orissa went to Calcutta to bathe in the sacred waters of the Ganges. Preparations for this inordinate rush of pilgrims have been proceeding since January, and the festival passed off without any untoward incident. Special transportation arrangements had to be made by all the three major railways in Calcutta. On the Eastern Bengal Railway over forty special trains were run between January 29 and February 3, the great majority of these being for Calcutta. Additional accommodation was also provided on the scheduled train services. Special trains were, moreover, put on by the East Indian and Bengal-Nagpur Railway administrations. The East Indian Railway has had to make special arrangements for the Magh Mela traffic to Allahabad, but the present rush found this railway fully prepared. The dispersal of the pilgrims from Calcutta was another problem that taxed the resources of the railways. Several trains were kept ready for departure from Howrah and Sealdah on the evening of February 3, while, on February 4, 52 special trains were scheduled

to leave Sealdah with returning pilgrims. It is understood that on the Eastern Bengal Railway alone, about 170 special trains have had to be introduced to deal with the Ardhodaya pilgrim traffic.

### Technical Research on Railways

A meeting of the Standing Finance Committee for Railways was held at New Delhi on February 2, with Mr. P. R. Rau, Financial Commissioner of Railways, in the chair. The committee also met on February 4 *et seq.* to consider the revised railway estimates for 1934-35 and the budget estimates for 1935-36. The committee sanctioned the Railway Board's proposal to make the Central Standards Office permanent. It will be recalled that the Pope Committee recommended that the Central Standards Office should be strengthened so that the railways might be kept abreast with modern developments by extended technical research. The Central Standards Office has already done much useful work in planning standard designs for numerous types of locomotives, underframes for carriages and wagons, vacuum brake, signalling and interlocking equipments, &c. The work of the office in connection with bridge design has been particularly important. It is only fitting that this office should be the nucleus of the railway research organisation, and should undertake specific research problems involving special technological knowledge. As the Railway Board considered it necessary to provide an annual grant for systematic research, the Committee sanctioned a sum of Rs. 50,000 for expenditure during 1935-36. The organisation will be placed on a permanent basis from April 1, 1935, with a Chief Controller, two Deputy Chief Controllers, and three Assistant Controllers.

### New Construction in Rajputana

The Government of India has sanctioned the construction, by the Jodhpur State, of a line of railway on the metre gauge from Marwar Junction station on the Bombay, Baroda & Central India Railway to Phulad, a distance of 15·85 miles. The line will be known as the Marwar Junction-Phulad Railway.

## FEDERATED MALAY STATES

### Long Metre Gauge Locomotive Runs Averaging 10,000 Miles a Month an Engine

A section of the main line of the Federated Malay States Railways—which is of metre gauge—runs from Singapore to Prai (for Penang), a distance of 488 miles, and between these two stations there is an express mail train service in each direction twice daily. With sleeping saloons and restaurant cars the usual number of coaches is 11 or 12 but this is frequently increased to a maximum of 16. For a distance of 429 miles between Singapore and Taiping the expresses are hauled by three-cylinder Pacific type locomotives, and during December five of these locomotives were allotted for this service. The engine diagramming provides for four locomotives at work with one spare to cover washouts, shed repairs and examinations. The train mileage completed by each of the five locomotives during December, 1934, was 10,112, 10,022, 10,476, 9,838, and 10,227, a total of 50,675 miles, and an average per engine of 10,135 miles. It would be interesting to know whether this constitutes a record for a metre gauge railway.

## FINLAND

### Rail Orders for 1935

The Finnish Railway Administration has just distributed its orders for the supply of rails for the current year. The total requirements amount to 15,210 tons, as compared with 14,340 tons in 1934. The following countries are sharing the orders:—

| | Tons |
|---|---|
| England ... ... ... | 4,500 |
| France ... ... ... | 7,140 |
| Belgium ... ... ... | 3,570 |

Delivery is to take place at the beginning of the next navigation period and the total cost is 29 millions of Finnmarks (E.F.)

## SOUTH AFRICA

### Financial Position

The railway earnings from transportation services only for the eight months April 1 to November 31, 1934, totalled £17,726,397, an increase of £2,084,458 as compared with the corresponding period of the previous year. Railway working expenditure totalled £12,104,195, an increase of £966,863. The accumulated deficit of £2,168,269 at the end of March has now been reduced to £164,387 after taking into account an amount of £558,000 being contributions to betterment, pensions and superannuation funds.

## MANCHUKUO

### Alternative Railway Routes

The latest maps and advice indicate that the northern extension of the State Railways from Pei-an Junction—on the Harbin-Hailun-Kochan-Tsitsihar loop line—to Heiho; on the south-west bank of the Amur River opposite Blagovestchensk, has now been completed. Also that Heiho is served by an alternative route, in the form of a motor bus service from the Tsitsihar-Mergen railhead at Mergen, via Ssuchan and Aigun. Another motor bus service feeds the north-western extension from Taoan to Solun along the alignment of the future railway extension which has for its objective Hundshur or Hulanarshan in the direction of Manchouli.

If, as seems probable, the railway is eventually extended to Manchouli, this frontier post and Hei-Ho will each have independent routes from different sea bases, namely:—Manchouli-Taoan-Mukden-Dairen and Manchouli-Harbin-Lafa-Rashin, also Heiho-Tsitsihar-Taoan-Dairen, and Heiho-Pei-an-Harbin-Lafa-Rashin. There will also be many cross connections between these main routes and loop lines available, and it is questionable whether any country in the present state of advancement of Manchukuo, has anything like the elaborate network of railways that state enjoys, or will very soon enjoy. The general development of the whole area, under able Japanese guidance, is undoubtedly phenomenal at the present time.

## CHINA

### Rail and Steamer Competition

The Kowloon-Canton Railway is now suffering from acute steamer competition. Since the introduction of a new motor vessel, the *Lee Hang*, the steamer owners have reduced their fares by 40 per cent. While, therefore, it is still quicker to travel between Hongkong and Canton by ferry and railway, the all-steamer journey is cheaper and more comfortable, especially at night. Even in the day time the change with baggage from rail to ferry or *vice versa* at Kowloon, is a disadvantage. The night journey by steamer is completed in comfort by breakfast time.

### Railway Developments in Shansi

On December 15 last the Yutze-Taiku section of the Chengtai Railway was opened for traffic, its length being 25 miles. There is now a daily service of two trains each way over this section and one train daily between Taiku and Taiyuan.

It is also reported that the Tatung-Puchow Railway has now reached Huochow some 140 miles south-west of Taiyuan, and that since July last trains have been running between Taiyuan and Chieh Hsiu, a distance of 90 miles. The newly opened 50-mile length is, apparently, in more difficult country, the Taiyuan plain having been left behind for the gorge of the Fen River which cuts through mountainous country in its descent from the plain to the Yellow River valley level. Though this line is termed a light railway, it is probable that it is light only in respect of rail weight and axle loading, and if the gorge presents real engineering difficulties, it is doubtful if either can be very light on the last-opened section. In any case it will be 400-500 miles in length when completed and will comprise a new north-south through route, which can, in consequence, hardly remain "light" for long.

XUM

# IMPRESSIONS OF OVERSEAS TRANSPORT

## *XII—What air-conditioning means in terms of comfort and equipment. Characteristic systems in use on the American railways described*

*By A. W. ARTHURTON, formerly Secretary, British Railways Press Bureau*

THE air-conditioning of passenger cars is an important feature of modern railway practice in the United States, and the various railways appear to be vying with each other in the rate at which their passenger stock can be fitted with the apparatus. Conditions in America are favourable to the demand for air-conditioning. Extremes of temperature occur which are never experienced in Great Britain. The average American room, building or train is, in my opinion, much over-heated! Indeed, I was seriously advised never to go indoors without taking off my overcoat unless I wanted to contract pneumonia on going out. As the difference in temperature indoors and outdoors is very great, I found the wisdom of this advice in New York, where a bitterly cold wind with occasional snow-flakes made waiting at street corners for the traffic lights to change an uncomfortable job. To go from an over-heated room to the freezing temperature of the streets was therefore asking for trouble.

For years the people of the U.S.A. have been accustomed to central heating plants in their houses, offices, theatres and other public buildings and even their motor-cars. But until recently hot weather and high temperatures had to be accepted as a fact about which nothing could be done, so that the introduction of a system of cooling the air in buildings or railway cars was enthusiastically received. There is, however, much more in air-conditioning than simply cooling or heating the air.

About 30 years ago doctors and scientists began a serious study of what makes people comfortable. Their findings definitely established air-conditioning as one of the principal requirements for comfort. The normal human body gives off enough heat in an hour to raise 1,000 cu. ft. of air some 20° F., so the necessity for removing this blanket of air is obvious. There are many ways by which this may be done, but the problem of creating a proper air movement without a draught is more difficult in a moving railway car than in a stationary building.

There are temperature limits between which comfort is felt by almost everyone. It is within the intervening range that the endeavour is made to keep air-conditioned cars at all seasons of the year. The temperature is adjusted to that existing outside the car, being near the upper limit in summer and near the lower limit in winter. Thus when one enters an air-conditioned car, no matter what the weather, the change is not so great as to be harmful. The carriage feels comfortably cool in summer and warm in winter. The cleanliness of the air is also an important feature, and air-conditioning assures a supply of filtered, and therefore dust free, air. Dust and dirt—likewise noise—are also excluded by the sealing of windows, and in some systems (not all) a generous supply of outside air is constantly being drawn in by means of an electric suction fan and mixed with air to be circulated a second time. Air-conditioning also controls the moisture content of the air, and the fans are placed to give sufficient air motion without draughts. Still air is not refreshing but moving air is, as ordinary electric fans amply prove.

Several air-conditioning systems have been developed to a high degree of mechanical perfection. There are the ice activated, the mechanical compression and the steam jet systems. Some railways, like the Pennsylvania, use all three. In the ice activated system, ice is placed in a bunker beneath the car, and, by means of motor-driven centrifugal pumps, ice water is circulated through air-conditioning units located in the upper deck at each end of the car. In these units the fresh and re-circulated air is cleaned, cooled and discharged directly into the body of the car in a proper manner to produce an agreeable atmosphere.

The mechanical compression system is similar to the ice system so far as air-circulation is concerned. Refrigeration, however, is produced by a motor-driven compressor instead of by ice. The refrigerant used is known as Freon. This refrigerant in a liquid state is circulated into the overhead air-conditioning units. Here it becomes a gas. In so doing, it absorbs heat from the car air, which is thereby cooled and de-humidified, being afterwards returned clean and fresh directly to the body of the car. The Freon gas passes back to the compressor where it is compressed and delivered to a condenser. In the condenser its heat is given off to the outside air, and it changes back to the liquid state, ready for use again. Briefly, then, in this cycle Freon acts as a vehicle for conveying heat from the inside of the car to the exterior.

In the steam-jet system, refrigeration is produced by spraying water into a partially evacuated, heavily insulated chamber. Here the water evaporates. In so doing it lowers the temperature of the remaining water and this cool water is circulated in the overhead air-conditioning units. The steam jet is used to evacuate the chamber and to compress the water vapour and steam to the slightly higher pressure of the condenser where the heat of the steam and vapour is given off to the atmosphere. The air circulation in this system is the same as that used in the two other systems.

The Carrier-Safety system of air-conditioning provides for either reciprocating compressor or steam ejector equipment. In the latter the compressor is replaced by a device which produces the same result by the direct use of steam. As the steam is used directly in the refrigerating apparatus, some of the losses entailed in transferring the energy of the fuel to the cooling system in the compressor method are avoided. In addition to the gain in efficiency accomplished by the direct use of steam there is the operating advantage that the cooling system can be used whenever there is a steam supply available. The cars are already steam heated and the steam can apparently be used for air-conditioning, which must result in a great saving of expense in equipment and operation.

So far as freight is concerned, Safety iceless refrigerator and heater cars with thermostatically controlled temperature are now operated on more than 80,000 miles of railroad throughout Canada and the United States.

Competition in comfort and speed is still very keen between the railways, and each appears to be doing its utmost by means of added comforts and amenities to attract passengers to its own route. The Pennsylvania has as a slogan, " the largest fleet of air-conditioned cars in the world." The New York Central advertises the " joy of live, filtered air, blissfully cool, refreshingly clean," and that practically all its luxurious great steel

fleet between New York and Chicago, Cleveland, Detroit, Cincinnati, Indianapolis and St. Louis is air-conditioned.

The Southern Pacific is equipping a further 260 cars at a cost of £400,000 to supplement the 100 cars now in service, and with the view of equipping the whole of the cars used in limited trains on its four transcontinental routes as well as the principal trains operating on the Pacific Coast. The Pullman Company is fast equipping its sleepers and dining cars, lounges, &c., and for these, the railways will have to pay an additional toll and in some cases have to supply the ice as well.

There is a wave of air-conditioning throughout the railways of the country, but whether the companies will recoup themselves in increased passenger carryings for the additional outlay involved seems to me somewhat doubtful. In any case, the conditions in Great Britain are in no way similar to those in the States. For dining cars and sleepers, where exclusion of dust, dirt, noise and stagnant air are of paramount importance, there is a strong case for the pressure ventilating equipment such as is already in use on the L.N.E.R., and L.M.S., and even full air-conditioning in sleeping cars. In places where the public is prepared to pay more for additional travel comfort of this nature, or to favour railways offering it rather than motorbuses, there may be a case for extending air-conditioning of passenger trains but the field for exploitation needs carefully investigating, both from the economic and technical points of view.

# SYSTEMATIC MAINTENANCE OF PERMANENT WAY

## *Scheming out the platelayers' work for the greatest efficiency on the L.N.E.R. (North Eastern Area)*

IN the North Eastern Area of the London & North Eastern Railway, systematic permanent way maintenance has been in operation since January 1, 1932, and we give below the calendar for 1935 which is issued to all inspectors and gangers throughout the area. The calendar is in the form of a foolscap-sized booklet of five duplicated sheets enclosed in a paper cover. The first sheet consists of the following general instructions:—

1.—The calendar of weekly working must be strictly followed, except: (*a*) in cases of emergency, or (*b*) where alternative work is authorised by the permanent way inspector.

2.—In cases of emergency, work necessary for the safety of the line must be carried out without waiting for instructions and irrespective of the calendar.

3.—No instruction slips will be issued by the permanent way inspector for the work shown on the calendar; each ganger must commence the various sections of work shown on the calendar on the precise dates laid down except where otherwise instructed.

4.—Other work will be authorised by the permanent way inspector by means of an instruction slip where (*a*) any section of work shown on the calendar is completed before the end of the allotted period, or (*b*) where the work shown on the calendar for a given period does not exist on a given length.

5.—All work must be pushed forward vigorously and continuously by all concerned so that the whole shall be completed throughout the length within the allotted period.

On the second sheet is the calendar of weekly working for the year 1935, as shown on page 330.

The last three sheets consist of instructions, as follow:—

1.—*OVERHAUL CHAIR FASTENINGS AND P. AND C. BOLTS: REGAUGE*

During this period chair fastenings should be tightened, or renewed where necessary, and the track regauged as instructed by the inspector.

All surplus fastenings which had been issued in connection with fastening periods, but have not been used, must be returned to the District Engineer's storeyard immediately following the end of that particular fastenings period.

2.—*SPOT SLEEPERING*

All spot sleepers on hand at the commencement of the spot sleepering periods are to be put in the track during these periods. All the spot sleepers must be put in to such gauge as the inspector shall instruct.

New sleepers must never be used in plain track in sidings.

The supply of spot sleepers will not necessarily be confined to the two specified weeks, but will be supplied from time to time and are to be put into the track during repair periods or inspectors' weeks.

3.—*INSPECTORS' WEEKS*

Work is to be carried out during these weeks as instructed by the permanent way inspector, who will issue instruction slips for the work to be done. All isolated point and crossing and fencing material on hand will be put in during this period.

4.—*THOROUGHLY REPAIR TRACK*

A quick run through the length should first be made and the worst places repaired. During the remainder of the allotted period, lining, lifting, packing, reseating of rails on chairs, adjusting of cant and cross levels, and weeding, should be carried out; if this work has not been completed throughout the length during the period it should be continued in each new period from the point which was reached at the end of the previous period.

*Packing.*—When packing, all sleepers should be tested by bumping for good bearing and also by watching the sleepers to see whether they yield under the passage of trains, particular notice being taken of sleepers which are end bound. Where sleepers have not a firm bearing they should be carefully packed, the packing to be carried out for about 1 ft. only on each side of the rail. Where sleepers are end bound the ballast should be loosened under the sleeper ends before packing.

*Reseat Rail on Chairs.*—Where rails are not bearing firmly on the seat of the chair, the key must be taken out, the sleeper and chair lifted up with the sway lever into firm contact with the rail and the key redriven. Where the chairs are British Standard pattern the keys must be reversed, upside down, before being redriven (a new key may be necessary); the sleeper should then be firmly packed. Cant on curves and cross levels on the straight should be carefully tested at close intervals by using the spirit level and blocks. Where cant or cross level is found to be incorrect the necessary adjustment must be made to bring the cant on curves to the exact amount shown on the cant plate, and to bring both rails to the same level on the straight. Any weeding and cess trimming necessary on the portion being repaired should be carried out at the same time as the repairs. As mentioned in the instruction referring to spot sleepering, any spot sleepers on hand should be put in during the "repair" period.

5.—*BURN DEAD GRASS WHEN WEATHER IS SUITABLE*

All dead grass and weeds on the railway sides are to be burnt off and as much loose *débris* as possible removed so as to provide a level bottom for grass cutting when the season for this work arrives. This work must be completed not later than March 16.

6.—*PULL BACK RAILS; ADJUST EXPANSIONS; OIL FISHPLATES*

Arrangements for the pulling back of rails and the adjusting of expansion, where this is necessary, will be made by the respective permanent way inspectors concerned.

In oiling fishplates, each pair of fishplates is to be completely removed and their fishing edges and the fishbolts carefully oiled. The fishplates are to be replaced exactly as they were before removal. Rail ends are to be carefully examined for defects before replacing the fishplates. Cracked or badly worn fishplates must be renewed.

7.—*CLEAN AND RENEW BALLAST; WEED AND TRIM CESS*

(*a*) *Stone Ballast.*—Cleaning stone ballast by hand should be carried out one track at a time in the following manner: To start with, one sleeper space should be cleared out entirely. The ballast in the adjoining space should then be loosened with a pick to about 5 in. below the bottom of the sleeper; the

PERMANENT WAY MAINTENANCE, NORTH EASTERN AREA, L.N.E.R.

CALENDAR OF WEEKLY WORKING FOR THE YEAR 1935

| Week Commencing | Work to be Carried Out: Monday to Friday | Instn. No. | Sat. |
|---|---|---|---|
| Jan. 1 | Overhaul chair fastenings and P. and C. bolts : Regauge. | 1 | Work as instructed by inspector. |
| ,, 7 | | | |
| ,, 14 | Put in all spot sleepers on hand .. .. | 2 | |
| ,, 21 | Inspector's week. Put in all isolated P. and C. and fencing on hand. | 3 | |
| ,, 28 | Thoroughly repair track. | 4 | |
| Feb. 4 | (*a*) Lift, pack and line. (*b*) Adjust cant and cross levels. (*c*) Reseat rails on chairs. (*d*) Weed where necessary. (*e*) Put in all spot sleepers on hand. — Burn dead grass when weather is suitable. (Inst. No. 5) | | |
| ,, 11 | | | |
| ,, 18 | | | |
| ,, 25 | Pull back rails ; adjust expansions ; oil fishplates. | 6 | |
| Mar. 4 | | | |
| ,, 11 | | | |
| ,, 18 | Inspector's week. Put in all isolated P. and C. and fencing on hand. | 3 | |
| ,, 25 | Overhaul chair fastenings and P. and C. bolts: Regauge. | 1 | |
| Apr. 1 | Thoroughly repair track. .. .. .. | 4 | Key up throughout length. |
| ,, 8 | (*a*) Lift, pack and line. (*b*) Adjust cant and cross levels. | | |
| ,, 15 | (*c*) Reseat rails on chairs. (*d*) Weed where necessary. | | |
| ,, 22 | (*e*) Put in all spot sleepers on hand. | | |
| ,, 29 | Clean and renew ballast .. .. .. | 7 | |
| May 6 | | | |
| ,, 13 | Weed and trim cess. | | |
| ,, 20 | Cut grass verge and coarse growth. | | |
| ,, 27 | Inspector's week. Put in all isolated P. and C. and fencing on hand. | 3 | |
| June 3 | Thoroughly repair track. .. .. .. | 4 | |
| ,, 10 | (*a*) Lift, pack and line. (*b*) Adjust cant and cross levels. | | |
| ,, 17 | (*c*) Reseat rails on chairs. (*d*) Weed where necessary. | | |
| ,, 24 | (*e*) Put in all spot sleepers on hand. | | |
| July 1 | | 8 | Key up throughout length. |
| ,, 8 | Cut and burn grass. | | |
| ,, 15 | | | |
| ,, 22 | Weed track throughout length. | | |
| ,, 29 | Overhaul chair fastenings and P. and C. bolts; Regauge | 1 | |
| Aug. 5 | Thoroughly repair track .. .. .. | 4 | |
| ,, 12 | (*a*) Lift, pack and line. (*b*) Adjust cant and cross levels. | | |
| ,, 19 | (*c*) Reseat rails on chairs. (*d*) Weed where necessary. | | |
| ,, 26 | (*e*) Put in all spot sleepers on hand. | | |
| Sep. 2 | Inspector's week. Put in all isolated P. and C. and fencing on hand. | 3 | |
| ,, 9 | Clean and renew ballast. | 7 | |
| ,, 16 | Trim hedges and casual shrubbery and burn trimmings. — Clean out open ditches and piped drains. (Inst. No. 9). | | |
| ,, 23 | Repair all fencing. | | |
| ,, 30 | | | |
| Oct. 7 | Overhaul chair fastenings and P. and C. bolts; Regauge | 3 | Work as instructed by inspector. |
| ,, 14 | Thoroughly repair track .. .. .. | 4 | |
| ,, 21 | (*a*) Lift, pack and line. (*b*) Adjust cant and cross levels. | | |
| ,, 28 | (*c*) Reseat rails on chairs. (*d*) Weed where necessary. | | |
| Nov. 4 | (*e*) Put in all spot sleepers on hand. | | |
| ,, 11 | Concentrate on a special tidying up throughout the length. | | |
| ,, 18 | Put in all spot sleepers on hand .. .. | 2 | |
| ,, 25 | Inspector's week. Put in all isolated P. and C. and fencing on hand. | 3 | |
| Dec. 2 | Thoroughly repair track .. .. .. | 4 | |
| ,, 9 | (*a*) Lift, pack and line. (*b*) Adjust cant and cross levels. | | |
| ,, 16 | (*c*) Reseat rails on chairs. (*d*) Weed where necessary. | | |
| ,, 23 | (*e*) Put in all spot sleepers on hand. | | |

ballast under the sleeper is not to be disturbed except the last 6 in. under the sleeper end which should be loosened. All the loosened ballast should then be shaken and cleaned with a ballast fork, the cleaned ballast being thrown into the adjoining space which has already been cleared out. The dirt and *débris* left behind by the ballast fork should then be cleared with a shovel to about 5 in. below sleeper level, the dirt and *débris* being thrown on the bank and spread neatly and evenly. The process should then be repeated for the next sleeper spacing and so on.

(*b*) *Ash Ballast*.—During the periods allotted for cleaning ballast, dirty and spent ash ballast should be renewed as supplies permit, particular attention being paid at the same time to the drainage of wet joints.

(*c*) Any weeding and cess trimming necessary at the same location should be carried out at the same time.

(*d*) The grass along the outer edge of the cess is to be well trimmed with a sickle or scythe for a distance of about 2 ft. from the cess throughout the length and any clumps of weeds or coarse grass on the slopes cut down.

8.—*CUTTING AND BURNING GRASS*

The permanent way inspector will issue instructions as to the amount of grass to be cut on each length. Inspectors and gangers must see that all necessary tools, scythes, strickles, forks, rakes, &c., are ready in good time for grass cutting to commence on the date appointed. As soon as any of the cut grass is dry enough to burn it should be raked into heaps and burnt, the raking being carefully done so as to clear all the hay off the slopes. Every advantage should be taken of dry days to get the grass burned.

9.—*CLEAN OUT PIPED DRAINS AND OPEN DITCHES*

All piped side or cross drains are to be cleaned by means of rods and all open side drains and ditches are to be cleaned out. This work should be done systematically from one end of the length to the other.

10.—*TRIM HEDGES AND CASUAL SHRUBBERY. REPAIR FENCING*

All hedges are to be neatly trimmed, and trimmings collected and burnt; hedge bottoms are not to be dug over. Casual shrubbery is to be trimmed off, collected and burnt; where necessary the slopes should be levelled neatly. All posts to be straightened and made firm, where necessary, and all wire tightened, and damaged droppers attended to. Damaged or missing fence rails are to be replaced and loose rails refixed.

11.—*KEY UP THROUGHOUT LENGTH*

On Saturday mornings, April to September inclusive, keying up is to be carried out systematically throughout the length by the whole of the men. Each key is to be tight, shims being put in where necessary behind the keys.

12.—*POINT OILING*

Point oiling is to be carried out on the days and at the times appointed. In general, point oiling is to be done at the end of the day, and completed in the shortest possible time.

*"WHATSOEVER THY HAND FINDETH TO DO, DO IT WITH THY MIGHT"*

The booklet bears the signature of Mr. John Miller, to whom we are indebted for the foregoing details.

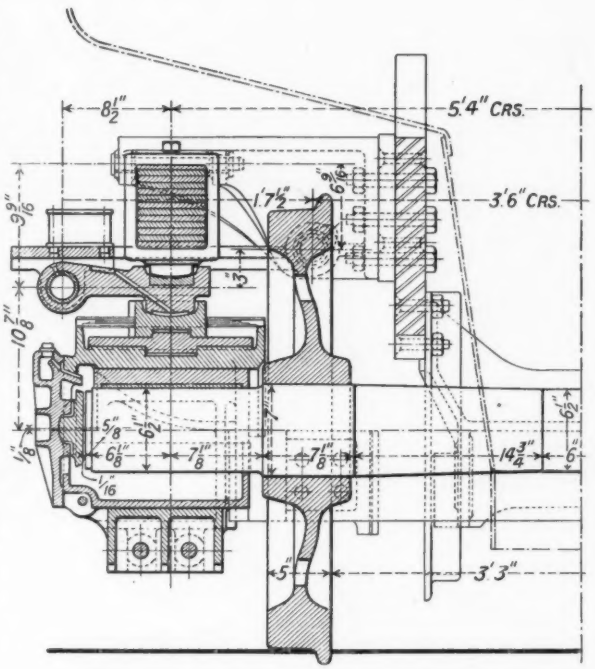
# SOUTH AFRICAN 4-8-2 TYPE LOCOMOTIVES

## *Some further details of construction*

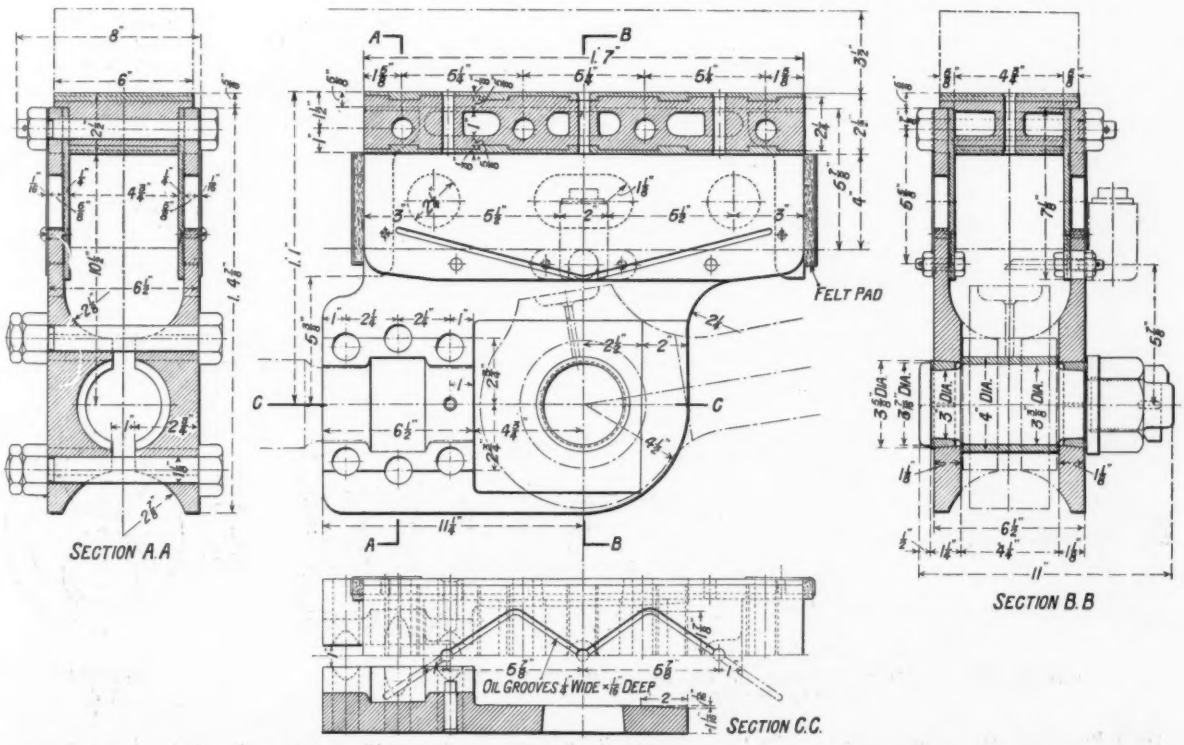
AN article on pages 794-800 of THE RAILWAY GAZETTE dated November 16, 1934, gave illustrated particulars of some new 4-8-2 type locomotives built by the North British Locomotive Co. Ltd., Glasgow, to the design and requirements of Mr. A. G. Watson, Chief Mechanical Engineer of the South African Railways and Harbours, and under the supervision of the High Commissioner's Advisory Engineer in London. On that occasion sectional elevation, plan and cross sectional drawings of the complete locomotive were reproduced together with some detailed drawings relating to the poppet valve gear mechanism. Reference was made in the article to the fact that the crossheads were of a new design embodying separate cheeks of forged steel securely bolted together over a double-coned collar on the piston rod thereby obviating the use of the usual cotter. Built up pistons, manufactured by Wota Limited, in which a double-coned fit is also used, preserve a degree of similarity in the piston rod and crosshead assembly.

The trailing truck axleboxes are as then stated provided with special thrust bearings attached to the covers, which have the advantage of relieving the ends of the gunmetal bearings from the effects of end thrust when traversing curves.

The accompanying drawings illustrate some of these details, and together with those already published in the previous issue referred to, provide a fairly comprehensive and graphic representation of the special features associated with the design of these interesting locomotives.




*Section through trailing wheel and axlebox*




*Details of new type crosshead with double-coned piston rod fitting*

# NEW FRENCH SUPERHEATERS

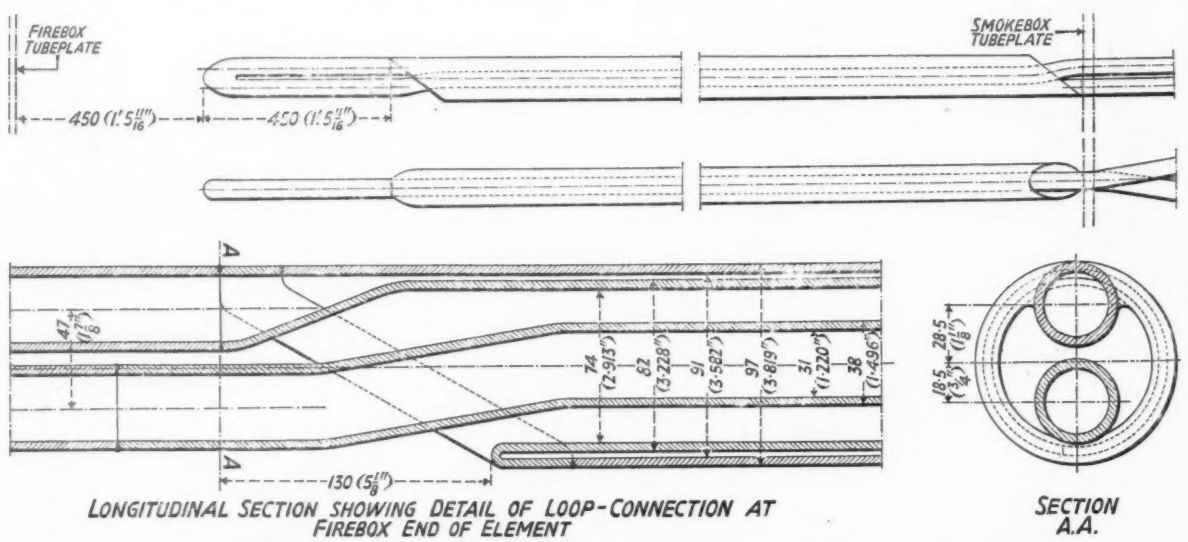
## *The latest type of Houlet annular superheater, built by the Société Vallourec, embodies an improved construction at the firebox end*

THE distinctive feature of the Houlet annular superheater is the circulation of steam in a thin layer between two streams of hot gases, thus securing a rapid and effective transference of heat. In principle the construction is simple, steam flowing through an annular space between concentric tubes and returning through a smaller tube mounted inside the other two. The practical difficulty of connecting the annular space to the header at one end, and to the return pipe at the other is overcome by the use of welded joints as shown in the accompanying illustrations. The construction illustrated is that employed by the Société Vallourec (6, Rue Daru, Paris), under the Louvroil and Recquignies patent, the welded joints being so disposed that they are not subjected to bending.

An important advantage of the new superheater is that its substitution for other types enables the superheat to be increased without reducing the steaming capacity of the boiler. This is not true of certain other methods, which have been tried for improving insufficient superheating. For example, the use of larger flues, the use of smaller superheater tubes, and the bushing of evaporating tubes at the tube plate, are all designed to increase the quantity of gas flowing over the superheater elements. This necessarily reduces the quantity of gas flowing through the evaporating tubes, and the reduction in the rate of steaming may more than counterbalance the increased superheat and result in lower overall efficiency. Where the annular superheater is employed, however,

COMPARISON BETWEEN SCHMIDT AND ANNULAR SUPERHEATERS IN FLUES OF 125 MM. (4 15/16 IN.) INTERNAL DIAMETER

| | Schmidt | | Annular | |
|---|---|---|---|---|
| | With 31/38 mm. (1·220/1·496 in.) Tubes | With 28/35 mm. (1·102/1·378 in.) Tubes | With 31/38 mm. (1·220/1·496 in.) Return | With 28/35 mm. (1·102/1·378 in.) Return |
| Steam flows through | Tube 31/38 mm. (1·220/1·496 in.) dia. | Tube 28/35 mm. (1·102/1·378 in.) dia. | Annular space between tubes 91/97 mm. (3·582/3·819 in.) and 74/82 mm. (2·913/3·228 in.) dia. | |
| Steam returns through | ditto | ditto | Tube 31/38 mm. (1·220/1·496 in.) dia. | Tube 28/35 mm. (1·102/1·378 in.) dia. |
| Weight | 11·835 kg./metre run (7·95 lb./ft. run) | 10·806 kg./metre run (7·26 lb./ft. run) | 17·515 kg./metre run (11·77 lb./ft. run) | 17·258 kg./metre run (11·60 lb./ft. run) |
| Heating surface, mean developed | 43·36 sq. dm./metre run (1·42 sq. ft./ft. run) | 39·58 sq. dm./metre run (1·30 sq. ft./ft. run) | 65·03 sq. dm./metre run (2·13 sq. ft./ft. run) | (64·086 sq.dm./metre run (2·10 sq. ft./ft. run) |
| Average weight of one element for a tube length of 4·40 metres (14 ft. 5¼ in.) | 50 kg. (110 lb.) | 46 kg. (101 lb.) | 70 kg. (154 lb.) | 68 kg. (150 lb.) |
| Area of passage for hot gases | 0·7736 sq. dm. (11·99 sq. in.) | 0·8424 sq. dm. (13·06 sq. in.) | 0·8029 sq. dm. (12·44 sq. in.) | 0·8221 sq. dm. (12·74 sq. in.) |
| Area of steam passage, flow | 0·0755 sq. dm. (1·17 sq. in.) | 0·0615 sq. dm. (0·95 sq. in.) | 0·1222 sq. dm. (1·89 sq. in.) | 0·1222 sq. dm. (1·89 sq. in.) |
| Area of steam passage return | 0·0755 sq. dm. (1·17 sq. in.) | 0·0615 sq. dm. (0·95 sq. in.) | 0·0755 sq. dm. (1·17 sq. in.) | 0·0615 sq. dm. (0·95 sq. in.) |




LONGITUDINAL SECTION SHOWING DETAIL OF LOOP-CONNECTION AT FIREBOX END OF ELEMENT

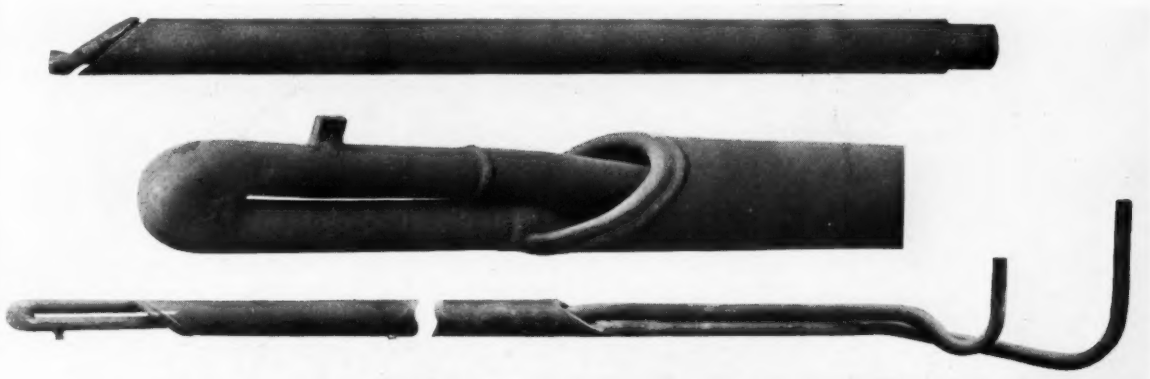
SECTION A.A.

*Houlet annular superheater element with Louvroil and Recquignies patent system of loop connection. Latest pattern as fitted on the latest rebuilt 4-8-0 and 4-6-2 locomotives of the P.O.-Midi Railways*

extra superheating surface is obtained without altering the distribution of gas flow between tubes and flues. Consequently, more heat is recovered from the gases in the flues, the rate of steaming is maintained, and the overall efficiency of the boiler is increased. It is possible either to increase the power for given fuel consumption or to reduce fuel consumption for given power developed.

The statements made in the preceding paragraph may be illustrated by reference to the accompanying table, which shows that a 125/133 mm. ($4\frac{15}{16}/5\frac{1}{4}$ in.) flue can accommodate a Schmidt type superheater element with a heating surface of about 40 sq. dm. per metre-run (1·31 sq. ft. per ft.-run), or an annular superheater element with a heating surface exceeding 60 sq. dm. per metre-run (1·97 sq. ft. per ft.-run), with practically the same passage for gas flow in both cases. Compared with the Schmidt superheater, the annular type therefore permits: (1) Higher superheat with the same number of elements, without reduction in steaming; or (2) increased steaming with the same superheat from a smaller number of elements, some of the latter being replaced by additional evaporating tubes.

Hitherto, the applications of the Houlet superheater by five great French railways have been for the purpose of increasing the superheat while maintaining the rate of steaming. In this, they have been consistently successful, the increase in steam temperature ranging from 35 to 50° C. (63 to 90° F.), given a maximum temperature of about 400° C. (750° F.), compared to the usual 375-385° C. (718-730° F.), other factors being equal. This corresponds to a net saving of fuel of nearly 10 per cent., a result confirmed by service trials. In every case, the substitution of the annular superheater elements involved no alterations in the tubing of the boilers and no change in the existing superheater headers. It is claimed that the new type can be fitted with equal ease in the flues of any existing locomotive, the superheater elements alone requiring to be changed.



*Top: annular superheater element in process of assembly, before welding-on the loop at the firebox end. Centre: detail of the welded loop connection at the firebox end of a Houlet superheater element (Louvroil and Recquignies patent construction). Bottom: complete annular superheater element as built by the Société Vallourec (Paris)*

*The L.N.E.R. 2-8-2 express locomotive "Cock o' the North" on exhibition at the Gare du Nord, Paris*

# INCREASING THE EFFICIENCY OF EXPRESS LOCOMOTIVES, EASTERN RAILWAYS OF FRANCE

*Modifications result in increased power and speed with substantial improvements in economy*

IN keeping with the general policy of the French railways, the Chemins de fer de l'Est, or Eastern Railways of France, have endeavoured to increase the schedule speed of their fast trains, which are hauled by compound locomotives of the 4-6-0, 4-6-2, and 4-8-2 wheel arrangements. The desired end could be attained only by increasing the running speed on sections where the maximum permissible speed (generally 120 km. or 74·6 miles an hour) was not already reached. This required the development of increased power at speeds from 75 to 120 km. (46·6-74·6 miles) an hour, the locomotives of the types mentioned originally developing their maximum output at speeds in the neighbourhood of 75-80 km. (46·6-49·7 miles) an hour, beyond which the available power decreased progressively. The alternative of increasing speeds by reducing the number of coaches in trains was commercially impracticable, especially as the progressive replacement of wooden by all-metal coaches resulted in heavier trains.

## Modifications Introduced

The only acceptable method of accelerating services, without the wholesale provision of new locomotives, was to modify the existing locomotives in such a way as to increase the power available at high speeds. The limitations of the locomotives in their original forms were found to be due partly to low efficiency of the boiler at high rates of steaming, and particularly to inadequate steam passages resulting in serious distribution losses when it was attempted to develop high power at high speeds. In order to remove these limitations, the company decided to effect modifications as follows:—

(1) Increased steam pressure.
(2) Improved distribution to reduce the losses between the throttle and the high-pressure cylinders, and between the high and low-pressure cylinders.
(3) Double-port piston valves (or poppet valves) on the low-pressure cylinders to increase the effective output.
(4) Reduction of back-pressure and improvement of draught by fitting a large high-efficiency blast pipe.
(5) Increased superheat.
(6) Application of a feed-water heater to reduce the consumption of water and coal.

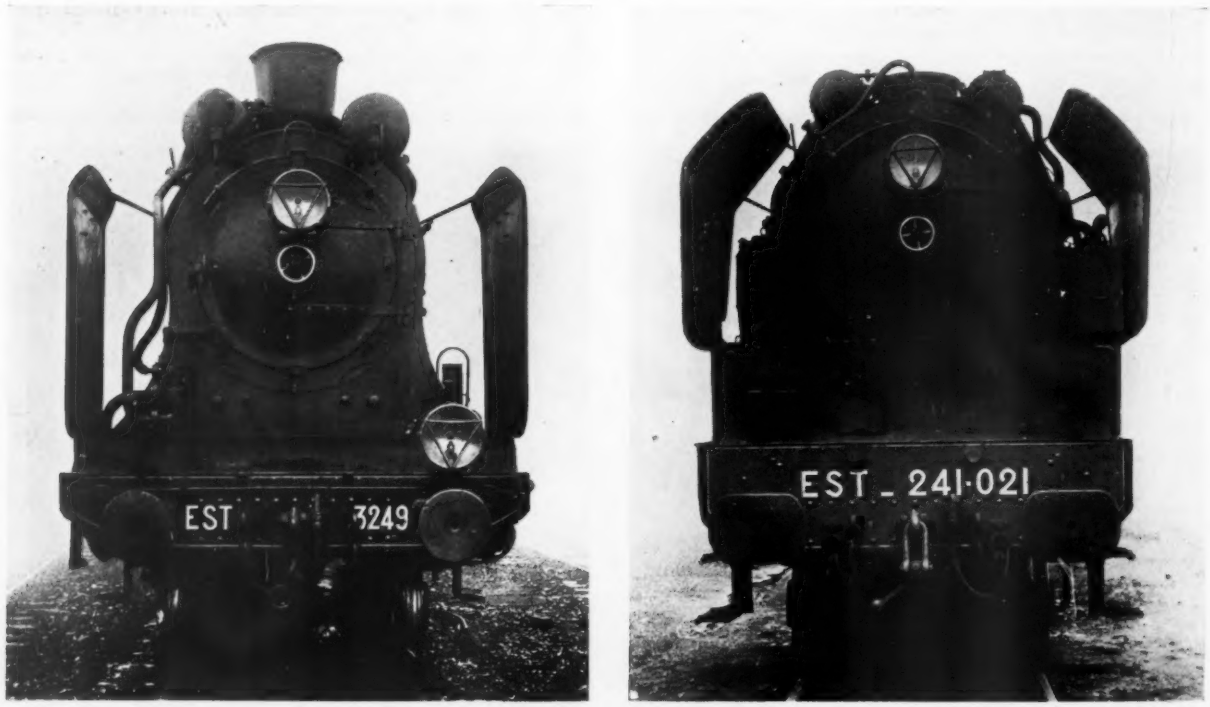
These changes were introduced experimentally in several 4-6-0 and 4-8-2 locomotives with such satisfactory results that the transformation of all the locomotives of these types is now in progress. The modifications of several 4-6-2 locomotives are also in hand and the preliminary tests on this type are very encouraging.

## Results Obtained

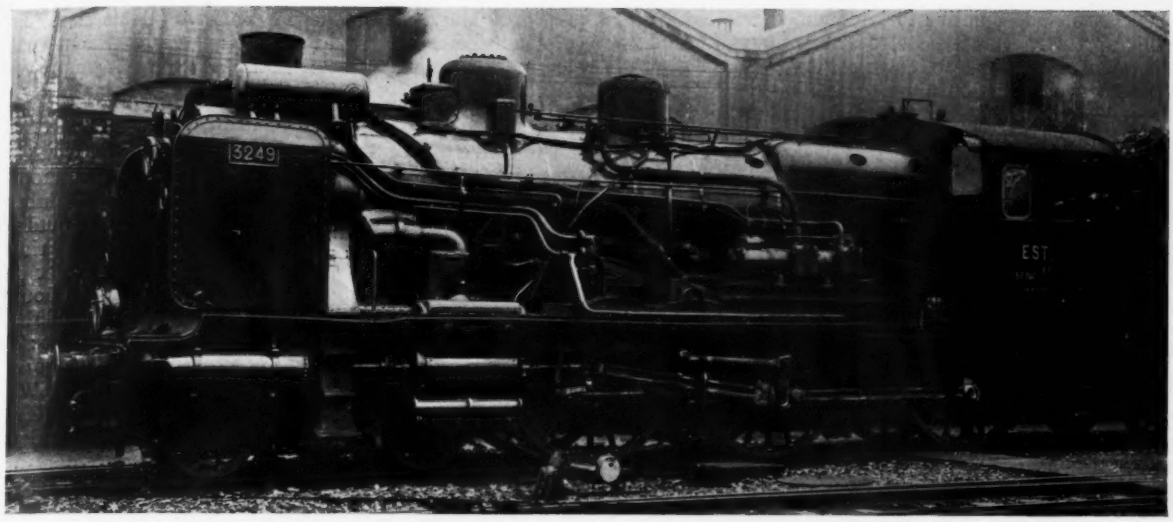
The accompanying table gives leading particulars of the three types of locomotives as modified (the corresponding data before modification being shown in brackets where a change has been effected). Supplementary notes relating to the modifications are given in the following paragraphs together with the results as at present ascertained.

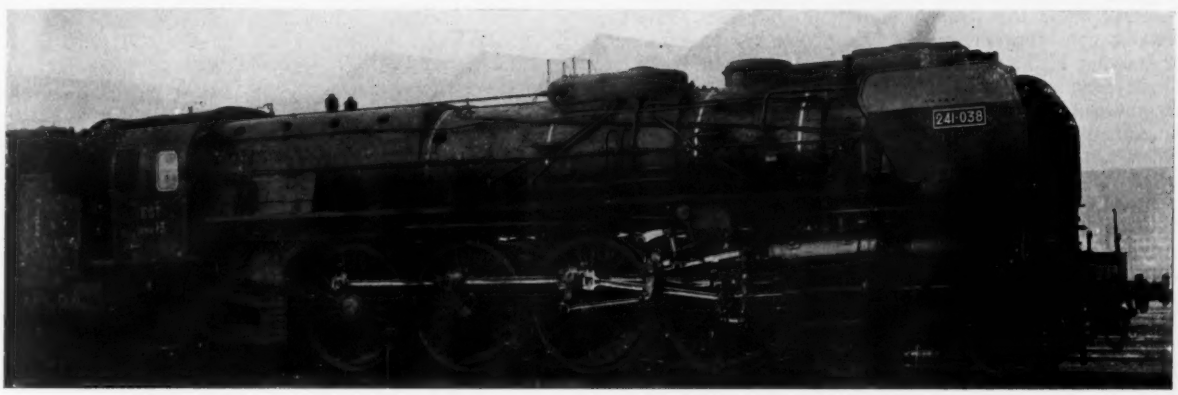
## 4-6-0 Type

The converted locomotives are fitted with a feed-water heater taking steam from the foot of the blast




*Front end views of (left) modified 4-6-0 locomotive No. 3249, and (right) one of the converted 4-8-2 type, Eastern Railways of France*




*General side view of (above) Est* 4-5-0 *locomotive No.* 3249 *and (below)* 4-8-2 *No.* 241-038, *both as now modified*

LEADING DIMENSIONS OF MODIFIED LOCOMOTIVES OF THE EASTERN RAILWAYS OF FRANCE
(N.B.—Where alterations have been made, the original dimensions, &c., are shown in brackets)

| Locomotives: Type and Serial Nos. | 4-6-0 Nos. 3231-3280 | | 4-6-2 (Pacific) Nos. 31001-31040 | | 4-8-2 (Mountain) Nos. 241001-241041 | |
|---|---|---|---|---|---|---|
| Cylinders, diam., h.p. | 370 mm. (405 mm.) | 14 5/16 in. (15 1/16 in.) | 420 mm. | 16 17/32 in. | 425 mm. (450 mm.) | 16 3/4 in. (17 1/16 in.) |
| ,, ,, l.p. | 590 mm. | 23 1/4 in. | 640 mm. | 25 3/16 in. | 660 mm. | 26 in. |
| ,, stroke | 680 mm. | 26 3/4 in. | 650 mm. | 25 19/32 in. | 720 mm. | 28 3/8 in. |
| Piston valves, diam., h.p. | 270 mm. | 10 5/8 in. | 270 mm. | 10 5/8 in. | 250 mm. | 9 27/32 in. |
| ,, ,, l.p. | 300 mm. double-port (350 mm. single-port) | 11 13/16 in. double-port (13 3/4 in. single-port) | 350 mm. double-port (flat slide valves) | 13 3/4 in. double-port (flat slide valves) | 300 mm. double-port (310 mm. single-port) | 11 13/16 in. double-port (12 3/16 in. single-port) |
| Admission lap, h.p. and l.p. | 27 mm. | 1 1/16 in. | 27 mm. | 1 1/16 in. | 36·5 mm. h.p., 37 mm., l.p. | 1 7/16 in. H.P., 1 29/32 in l.p. |
| Exhaust lap, h.p. | −6 mm. (zero) | 5/64 in. (zero) | −6 mm. (−3 mm.) | −5/64 in. (−1/8 in.) | −6 mm. (zero) | −5/64 in. (zero) |
| ,, l.p. | −3 mm. | −1/8 in. | −5 mm. | −3/16 in. | −10 mm. | −27/64 in. |
| Ratio of swept volume, l.p. cyl./ h.p. cyl. | 2·547 (2·138) | — | 2·32 | — | 2·41 (2·16) | — |
| Regulating pressure of receiver valve | 6 hpz. | 87 lb. per sq. in. | 6 hpz. | 87 lb. per sq. in. | 7 hpz. (6 hpz.) | 102 (87) lb. per sq. in. |
| Coupled wheels, diam. | 2,090 mm. | 6 ft. 10 1/4 in. | 1,950 mm. | 6 ft. 4 3/4 in. | 1,950 mm. | 6 ft. 4 3/4 in. |
| Boiler working pressure | 18 hpz. (16 hpz.) | 261 (232) lb. per sq. in. | 17 hpz. (16 hpz.) | 247 (232) lb. per sq. in. | 20 hpz. (17 hpz.) | 290 (247) lb. per sq. in. |
| Grate area | 3·14 sq. m. | 33·79 sq. ft. | 4·27 sq. m. | 45·94 sq. ft. | 4·43 sq. m. | 47·67 sq. ft. |
| Type of superheater | DM3 (DM4) | — | DM3 (Schmidt) | — | DM3 (DM4) | — |
| ,, blast pipe | Large section trefoil (Nord) | — | Large section trefoil (Nord-trefoil) | — | Large section trefoil (ordinary trefoil) | — |
| Chimney, diam. at top | 610 mm. (425 mm.) | 24 in. (16 3/4 in.) | 620 mm. (440 mm.) | 24 3/8 in. (17 5/16 in.) | 600 mm. (460 mm.) | 23 5/8 in. (18 1/8 in.) |
| ,, diam. at throat | 500 mm. (380 mm.) | 19 11/16 in. (14 15/16 in.) | 500 mm. (325 mm.) | 19 11/16 in. (12 13/16 in.) | 500 mm. (380 mm.) | 19 11/16 in. (14 15/16 in.) |

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pipe. The first locomotive to be modified was No. 3249, the high-pressure valve chests of which were fitted with a communicating pipe to equalise the steam flow and utilise the two admission pipes simultaneously for cut-offs below 50 per cent. As a result of the modifications, locomotive No. 3249 develops its maximum power at 110 km. (68·4 miles) an hour, compared with 75 km. (46·6 miles) an hour in the original machines. The outputs developed by the high and low pressure cylinders are approximately equal, thus equalising the driving torque. For equal consumption of water per mile, the increase in power resulting from the modifications is about 50 per cent. The maximum sustained drawbar horsepower, without exceeding a rate of combustion of 550 kg. per sq. m. (112·6 lb. per sq. ft.) of grate area per hr., is 1,340 metric h.p. at 85 km.p.h. (1,323 h.p. at 52·8 m.p.h.) for locomotive No. 3249, compared with 990 metric h.p. at 65 km.p.h. (977 h.p. at 40·4 m.p.h.) for a non-modified locomotive. On this basis, the gross gain is only 35 per cent., but if the maximum outputs be compared at equal speeds the difference in favour of the modified locomotive increases as the speed rises.

The consumption tests on the modified locomotive No. 3249 show that there is about 30 per cent. saving in water consumption, and 40 per cent. saving of coal per drawbar h.p.-hr. Moreover, these savings per h.p.-hr. remain practically constant for a given speed whatever the power developed, which is not so in the case of the unmodified locomotives.

### 4-6-2 (Pacific)

The low-pressure cylinders of these locomotives were originally fitted with flat slide valves and will be replaced by cylinders with double-port piston valves or with Dabeg poppet valves, according to the results of trials now in progress. Only one modified locomotive of this class has yet commenced its trials, but it is already apparent that the reconstruction has resulted in considerable improvement in steaming, both in capacity and efficiency.

### 4-8-2 (Mountain)

The converted locomotives have been fitted with exhaust steam feed-water heaters. The first locomotive to be modified, No. 241.038, is provided with separate-chamber superheater header, large admission pipes and an equalising pipe between the high-pressure steam chests. Trials with this machine show that the maximum power is attained at a speed of about 100 km. (62·1 miles) an hour, compared with 80 km. (49·7 miles) an hour in unmodified locomotives of the same series. The drawbar horsepower has been increased by about 40 per cent. at given cut-off and speed, and an indicated output of about 3,700 metric h.p. (3,652 i.h.p.) is attainable at 100 km. (62·1 miles) an hour, the output of the two groups of cylinders being also appreciably equalised. On an average, the modifications have reduced the water and fuel consumptions of this locomotive by about 15 per cent. for the same drawbar h.p.

### Conclusions

The modifications effected in the 4-6-0 and 4-8-2 locomotives have resulted in higher drawbar horse-power at high speeds, the increase amounting to about 50 per cent. in the former locomotives and 40 per cent. in the latter locomotives. At the same time, the consumptions of water and coal have been materially reduced.

The alterations, which have involved a minimum of expense, consist mainly in the application of double-port piston valves to the low-pressure cylinders, and in an improvement of steam distribution and exhaust effected while utilising existing pipes, cylinders and motion work.

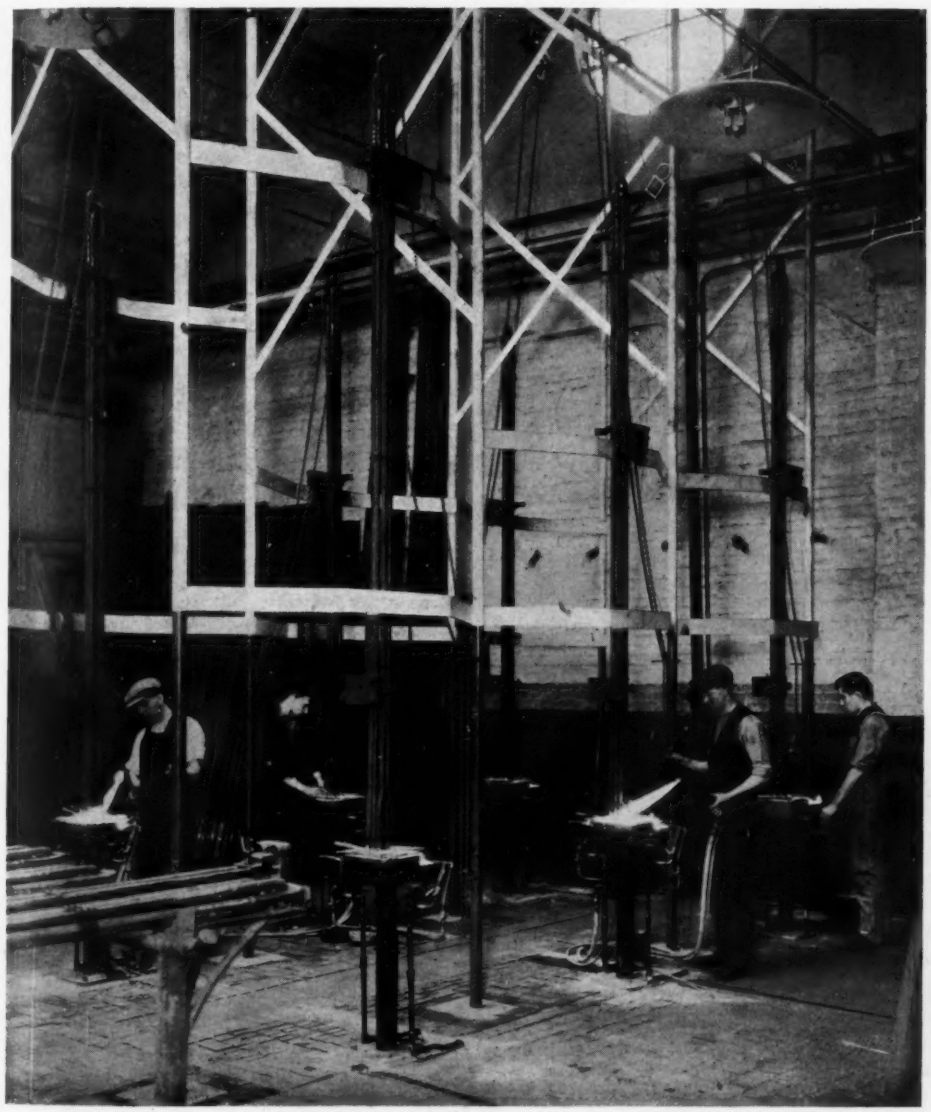
*Down P.1 express headed by a "C" class 4-6-2 locomotive, passing Combs-la-Ville, C. de f. P.L.M.* (*see pages* 346-7)

# MANUFACTURE OF SUPERHEATER UNITS

## *New system at G.W.R. works at Swindon*

A GRADUAL but complete change has taken place in the methods of manufacturing superheater units at the Swindon works of the Great Western Railway. These were previously composed of three pairs of tubes welded by oxy-acetylene to steel return bends, and at the other end expanded into a cast steel unit header; the holes through which the expander operated were sealed by screwed plugs.

The welding of the unit tubes to the return bends is now carried out on a flash welding machine manufactured by the British Insulated & Helsby Cable Co. Ltd. The tube and bend butt together and are clamped by hydraulic cylinders fitted with two copper contact blocks. Power is taken at 3,300 volts a.c., 3-phase, to a transformer which reduces it to single-phase current at 400 volts, and it is reduced further by the windings within the welding machine. Upsetting pressure is produced by a spring and cam; the latter is changeable for dealing with unit tubes and $5\frac{1}{8}$-in. superheater flues. The current reading on the high tension circuit during the heating up of the tubes is about 18 amp. when dealing with superheater flues, rising considerably for a few seconds during the final push-up. The corresponding reading on unit tubes is about 10 amp. The internal scarf is removed by a dolly actuated by a hydraulic cylinder, while the tube remains clamped immediately after welding. The external scarf, where necessary, is removed by grinding.



*Structure and hearths for brazing Superheater units. On the left foreground the unit header is assembled on the tubes and secured by a clamp until finally in position in the hearth*

The unit headers were previously steel castings, but now take the form of drop stampings. They are stamped solid and the steam passages are formed by drilling the two legs on a 2-spindle Asquith machine, and on the same machine drilling into the end holes from one face to accommodate the three pairs of tubes. The open ends of the headers are sealed by means of acetylene welding.

The tubes are fixed in the unit headers by brazing, for which a batch of gas brazing hearths has been installed beneath a light welded-up tubular structure from which the units are hoisted and suspended, return bends upwards, with the headers resting on the hearths. Fixed air and gas blow pipes directed on to the headers carry out the necessary preheating, and the final brazing is effected by a hand-operated portable blow pipe in conjunction with the necessary application of brazing rod and flux. Each complete unit is afterwards subjected to a hydraulic pressure test. The structure, hearths, and blowpipes were made in the company's works at Swindon.

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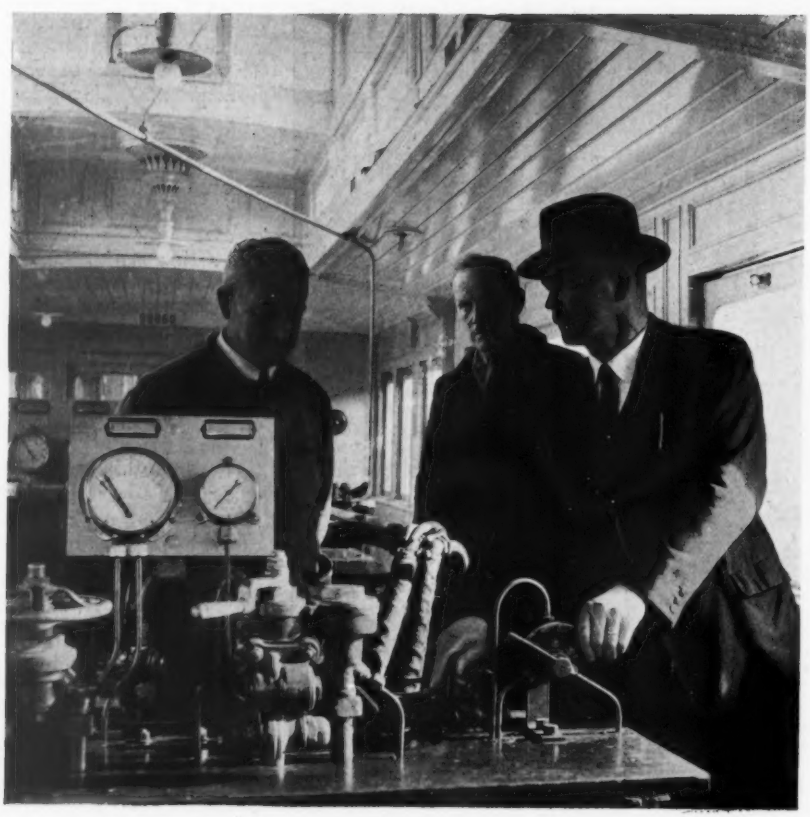
# Scenes on the Swiss Federal Railways

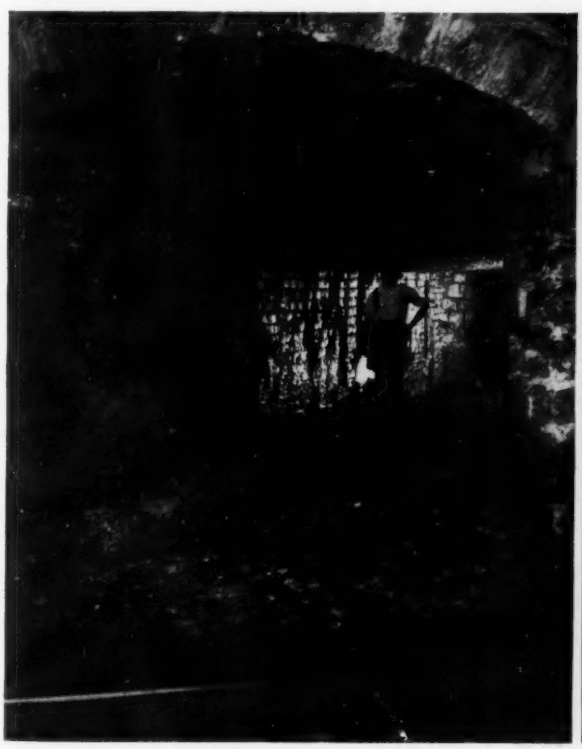
(See calendar review on page 324)

*Above: The 537 electric locomotives and railcars of the Swiss Federal Railways covered 250,000 km. more in 1933 than in 1932, but working expenses were reduced by fr. 13·4 million*

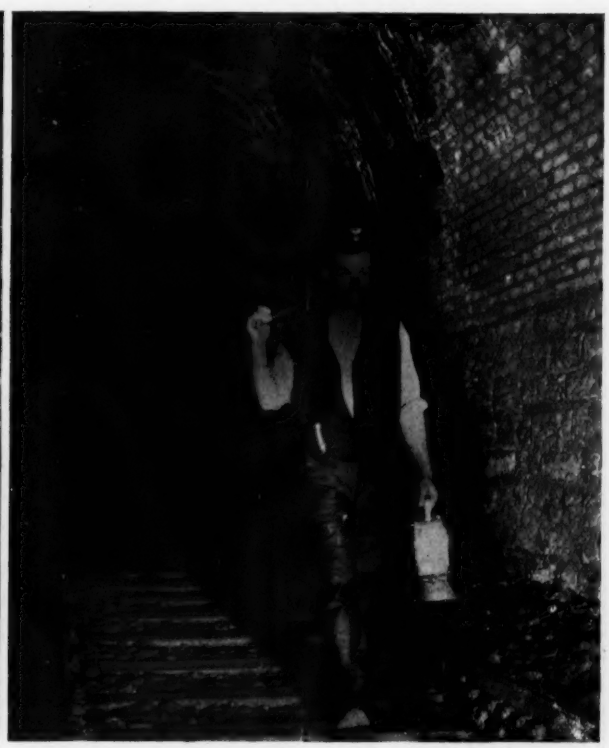


*Left: A railwayman undergoing instruction in the specially fitted van used to demonstrate the principles of compressed air braking*

*A refreshment trolley from which passengers can buy glasses of pasteurised milk is a novel amenity at Swiss railway stations*



*A view in one of the connecting passages which occur every 200 m. between the parallel bores of the Simplon tunnel*



*Of a total kilometrage of 2,876, some 163 km. of the Swiss Federal Railways are in tunnel and are subject to constant inspection*

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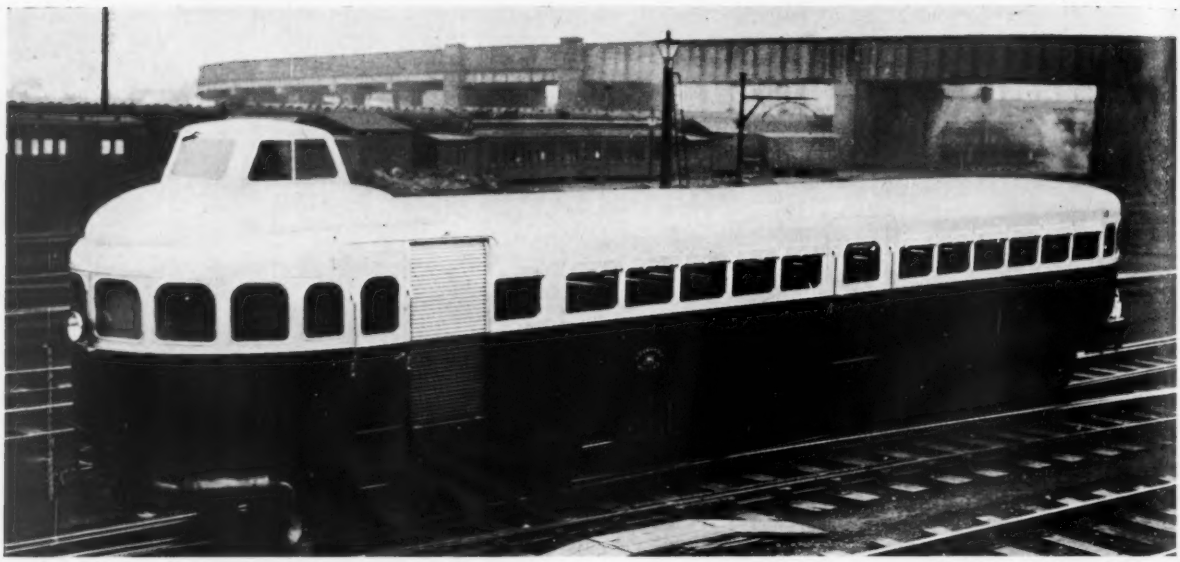
# PNEUMATIC-TYRED RAILCAR ON THE L.M.S.R.

***This 56-seat petrol-engined vehicle, demonstrated on Monday, is inaugurating an experimental cross-country service between Oxford and Cambridge***



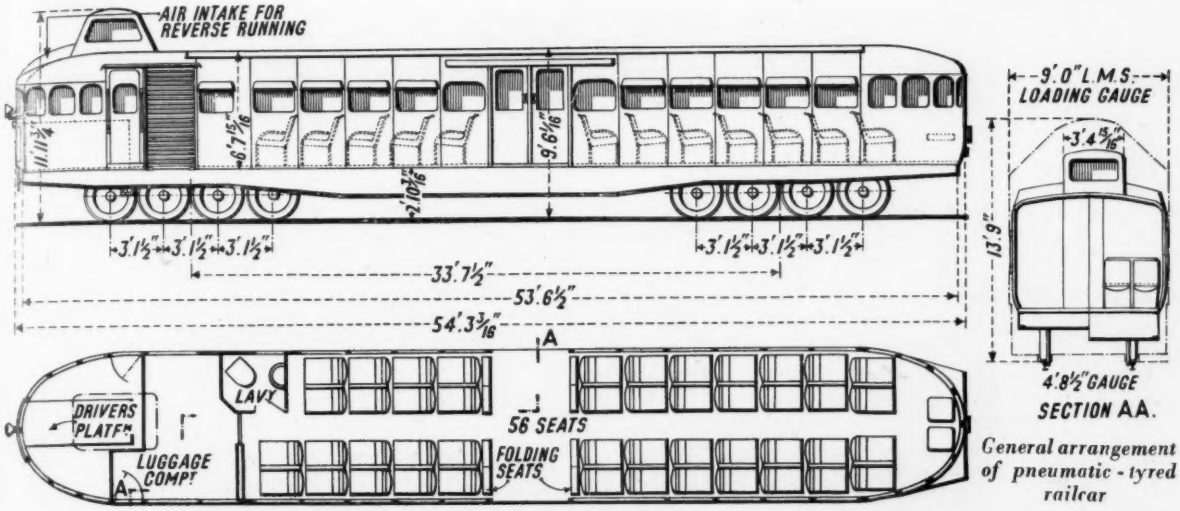
THE Michelin pneumatic-tyred railcars with petrol engines up to 300 b.h.p. are well-known by reason of their extensive application to fast and slow passenger services in France and the French colonies. A trial car was seen in England over three years ago, and described in THE RAILWAY GAZETTE of February 12, 1932 (p. 209), but the latest of this type of pneumatic-tyred railcar has just been introduced into this country in the form of a 56-seater vehicle which is about to inaugurate a through cross-country service between Oxford and Cambridge on the L.M.S.R.

*Interior of new 240-b.h.p. Michelin railcar on the L.M.S.R.*

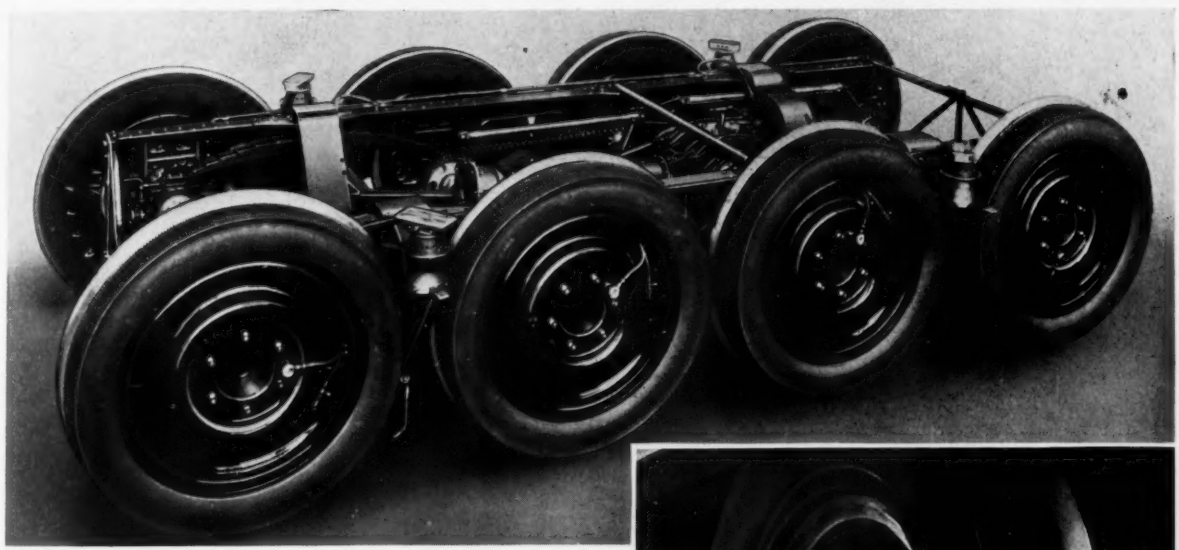
This type of car is being sponsored in England by Armstrong-Siddeley Motors Limited. A demonstration trip was made on the L.M.S.R. main line between Euston and Leighton Buzzard on Monday last, but prior to this, experimental trips had taken place on the Southend and the Western Section main lines. The principal advantages of the pneumatic-tyred vehicle, namely, rapidity of acceleration and deceleration, light weight, and silence, were amply proved during the course of Monday's run. In the down direction, stops were made at Willesden and Watford, but on the return journey the car ran non-stop from Leighton Buzzard to Euston, 40·2 miles, in 42½ min. without exceeding 66 m.p.h. Up the 1 in 333 grade to Tring, a speed of 56-61 m.p.h. was maintained without difficulty. On the down journey the maximum rate was 68·2 m.p.h. Braking tests at Willesden and Watford showed that the car could be brought to rest from a speed of 55 m.p.h. in 9½ sec. without discomfort to the passengers, but we understand that under similar conditions a time of 7½ sec. has been sufficient. A feature of the run was the complete elimination of shocks due to rail joints and crossings and the absence of hunting movements. The fuel consumption averaged about 6 m.p.g.

The railcar now in England is of the standard Michelin 16-wheeled type, and, thanks to the special design, incorporating a light welded steel underframe, and the use of light aluminium alloys in the body, it tares only 8·25 tons, or 330 lb. per seat. The 12-cylinder petrol engine, mounted on the body chassis, is of the Hispano-Suiza type, and develops 240 b.h.p. continuously at 3,000 r.p.m. The engine torque is transmitted through a self-changing four-speed gearbox and roller chains; three of the four axles of the driving bogie are driven.

The suspension is by semi-elliptical steel springs and rubber. The central rubber-mounted pivot carries no vertical load. The wheels, of the pressed steel disc type, are 36 in. diameter and are fitted with Michelin pneumatic




*General arrangement of pneumatic-tyred railcar*



tyres having steel flanges with rubber silencing inserts. The tyres are inflated to a pressure of 95-100 lb. per sq. in., and a loss of pressure in any tyre causes a hooter to sound in the driving cab. As a double precaution against instability in the event of a puncture—an extremely rare and unlikely occurrence—there is a rim inside the tyre which prevents more than a very small loss of diameter when the tyre is completely deflated. Two spare wheels and tyres are carried.

Braking is on the Westinghouse compressed air system with boosting Lockheed hydraulic brakes, and operates independently on each bogie.

Spring-controlled rail shoes are fitted so that the car can be operated over track-circuited sections. There is a driving cabin of the conning-tower type over the engine, and this allows of the car being driven in either direction. The luggage compartment is fitted with a steel roller door on each side. The interior is light and comfortable, and is provided with lavatory accommodation and electric lighting and heating. Such an excellent outlook is obtainable from the car, that reversible seats would be an advantage. The firm associated with Armstrong-Siddeley Motors Limited in the production of these vehicles in England is the Coventry Pneumatic Railcar Company.

*Above, the driving bogie, with (below) the pneumatic-tyred wheel and steel tread*

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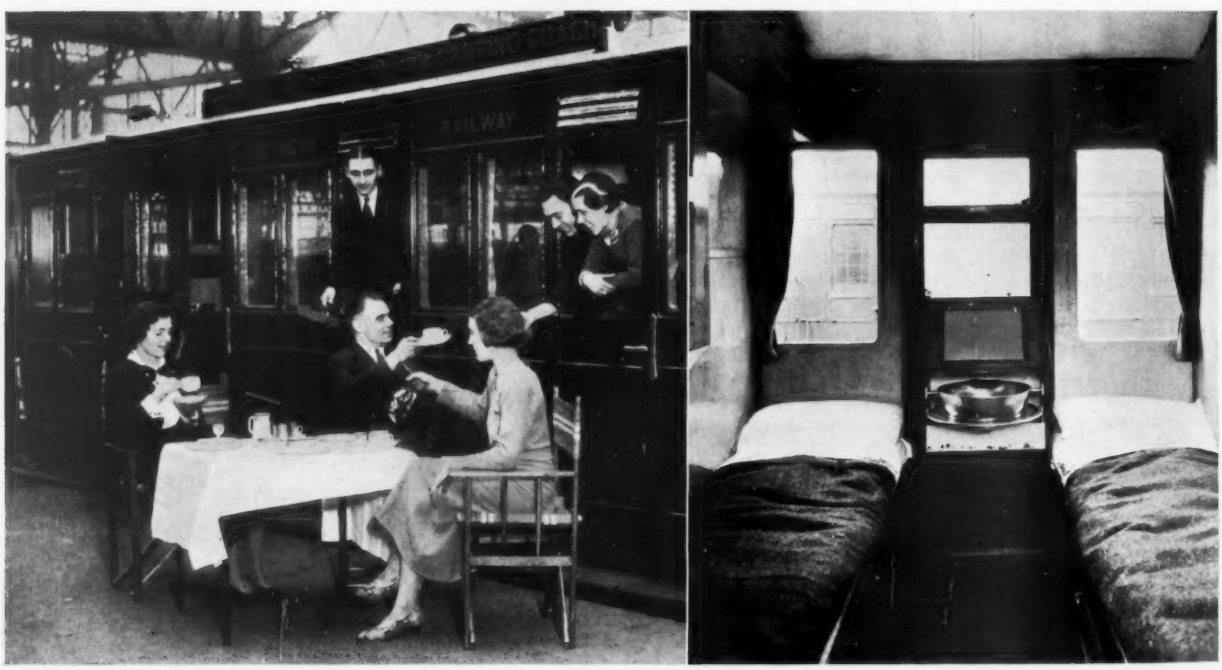
*Mr. Gilbert S. Szlumper, Assistant General Manager, Southern Railway, presenting a model of the company's new "Schools" class locomotive, "Kings—Wimbledon" (his former school) to the headmaster, Mr. C. J. Dixon, M.A., when the engine was exhibited at Wimbledon station on February 15, and inspected by the boys*



*A camping coach with its own wireless aerial and water supply is the Southern Railway's novel contribution to this popular form of open-air holiday. An exhibition coach is being shown at the company's London termini and is seen above at Waterloo. Each vehicle has a living room, kitchen and sleeping compartments, one of the latter being shown on right*

# RAILWAY NEWS SECTION

## PERSONAL

The King invested Sir Josiah Stamp with the insignia of Knight Grand Cross of the Most Honourable Order of the Bath on February 19.

It is with regret that we note the death, on February 15, of Mr. Edward Dight Gerrard, a Director of the North British Locomotive Co. Ltd. Mr. Gerrard joined the firm as a junior draughtsman and rose to become, about a year ago, one of the technical directors and had under his charge the drawing office.

Sir Alfred Ewing, K.C.B., F.R.S., left estate valued at £36,816 (£36,694 net).

Mr. J. W. Kidd, General Manager of the Metropolitan-Cammell Carriage & Wagon Co. Ltd., has been appointed to the board of the Midland Railway Carriage & Wagon Co. Ltd., with effect from February 6.

Mr. W. N. Kerr, of the Divisional General Manager's Office, L.N.E.R., Edinburgh, has been appointed Chief Assistant to the District Goods & Passenger Manager, Edinburgh, to succeed Mr. C. Kinloch, who is retiring shortly. Mr. Kerr has had many years' experience in the General Manager's Department, and since 1920 has been associated with the General Manager in Edinburgh as Personal Assistant. Mr. Kerr has represented the Divisional General Manager on a number of committees sitting in London and has been the Scottish representative for the *L.N.E.R. Magazine* during the last 11 years. A student of railway history, he has from time to time contributed articles to the press on this subject. Mr. Kerr served with the 5th Royal Scots at Gallipoli and later with the Royal Engineers in Egypt and Palestine.

Mr. T. C. Durnan, who has been Sales Manager of the Laycock Engineering Company for many years, is now resident in London in charge of the newly-established office of that firm at 90, Fenchurch Street, E.C.3 (Telephone Royal 3057).

We regret to record the death, on February 15, of Mr. J. S. Anderson, formerly Secretary of the Anglo-Argentine Tramways Company.

Mr. Charles Hubert Stemp, C.B.E., who, as announced in THE RAILWAY GAZETTE of February 1, will shortly retire (in March) from the position of Superintendent, Southern Scottish Area, L.N.E.R., has had more than 50 years' service with that group and its constituent companies. He was educated at Cambridge, and joined the Great Eastern Railway at Histon station in 1884. After extensive experience at various stations and in all departments, he was transferred to the Northern, or Norwich Division, and, within 12 years of joining the railway, was appointed Chief Assistant to the District Officer of that division. Mr. Stemp was then selected to carry out special duties in the Traffic Working Section at headquarters, Liverpool Street, and was subsequently appointed a first class stationmaster in the London District. In 1906 he accepted the appointment of Traffic Assistant to the Superintendent of the Line, North British Railway, and, as a result of the marked operating improvement effected by him, he soon became Assistant Superintendent of the Line. In 1916 Mr. Stemp was promoted to be Operating Superintendent. Upon the amalgamation he became Superintendent of the Area comprising the former N.B.R., the position from which he now retires. During the war he was the railway officer responsible for all military and naval movements in Scotland, working in close contact with the Scottish Command. Three times Mr. Stemp was specially honoured by the King, on the first occasion receiving the O.B.E., on the second the C.B.E. at his hands, and on the third he was personally thanked by His Majesty for his services in connection with railway movements. He was also the recipient of several personal gifts from the King and other Royalties. Mr. Stemp was commissioned as a Major in the Royal Engineers and Railway Staff Corps in May, 1917. His remarkable career is referred to editorially on page 323.

*Mr. C. H. Stemp, C.B.E.,*
Superintendent, Southern Scottish Area, L.N.E.R., 1923–35

At a meeting of the Railway Clearing House Superintendents' Conference, held on February 13, Mr. C. H. Stemp, who, as stated above, is shortly retiring from the position of Superintendent of the Southern Scottish Area, L.N.E.R., was the recipient of a gold cigarette case from the members of the conference. Mr. E. C. Cox, Chairman of the conference for the current year, in making the presentation, referred to Mr. Stemp's long association with the conference, of which he had been a member since January, 1917, and Chairman for the year 1925. Mr. Cox said that the conference desired to give some tangible expression of the esteem and regard in which Mr. Stemp was held by his colleagues, and in presenting the cigarette case, he expressed for himself, and on behalf of his colleagues, the hope that Mr. Stemp would have many years of good health in which to enjoy his well-earned retirement. Mr. Stemp replied suitably.

Mr. C. W. Reeve, Chairman and Managing Director of the Associated Equipment Co. Ltd., has been appointed a member of the Advisory Council of the Board of Trade.

Consequent upon the recent changes in the Italian Cabinet, Signor Puppini has resigned from the Ministry of Communications and has been succeeded by Signor Antonio Stefano Benni. Born in 1880, Signor Benni as a young man joined the firm of Ercole Marelli, elec-

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trical manufacturers, and rose from the most junior grade eventually to become Chairman of the company, which is a world-wide organisation. He entered Parliament in 1921 and, two years later, was elected Chairman of the Italian Federation of Industries, a position he held until December, 1933. He is also Chairman of the Banco di Roma and one of the principal Italian Joint Stock Banks.

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Mr. Walter Eraut, C.B.E., M.Inst.C.E., who, as announced in THE RAILWAY GAZETTE of February 8, is retiring from the position of Chief Engineer (Contracts) to the Crown Agents for the Colonies, was born in 1874 and educated at Haberdashers' Aske School, now at Hampstead. After studying at the Royal College of Science, he was trained as an engineer at the General Engine & Boiler Co.'s works, New Cross. He was then employed until 1901 under the late Mr. Percy Griffith on waterworks and gasworks for Clacton, Tonbridge, Cromer, Ilford, Gainsboro, Lincoln, and other towns. In the latter year he entered the service of the Crown Agents as an engineering assistant in what was then the Works Department. He became Deputy Head of the Department in 1913, acting Head in 1915, and was appointed Chief Engineer (Contracts) in 1922, the appointment which he is now relinquishing. An account of the work of the Contracts Department appeared in our contemporary *The Crown Colonist* in August, 1933. Mr. Eraut received his C.B.E. in the recent New Year Honours.

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Mr. W. L. Watson, Assoc.M.Inst.C.E., who, as announced in our issue of February 8, has been appointed Chief Engineer (Contracts) to the Crown Agents for the Colonies in succession to Mr. W. Eraut, who retires on March 11, was educated at the Grammar School and Robert Gordon's College, Aberdeen. He then underwent a period of training at the Great North of Scotland Railway's locomotive works at Kittybrewster and Inverurie, and was subsequently at the Great Western Railway locomotive works at Swindon from 1905 to 1912, when he joined the Engineering Design Department of the Crown Agents for the Colonies. In 1915 Mr. Watson was seconded to the Raw Materials Department of the Ministry of Munitions, and in 1919 was made Deputy Head of the Crown Agents Engineering Design Department. In 1928 he was appointed Deputy Chief Engineer (Mechanical), which position he has occupied up to his present appointment. Mr. Watson is a Member of Council of the Institution of Locomotive Engineers.

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Mr. Thomas Richard Johnson, formerly Chief Commissioner of Railways, New South Wales, left estate valued at £15,955 (£15,890 net).

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We regret to record the death, on February 16, of Mr. T. D. Weir, M.I.E., B.Sc., M.Inst.C.E., late Major R.E., formerly Deputy Chief Engineer Construction, Nigeria, and General Manager, Venezuelan Central Railway.

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The high esteem in which Mr. A. B. Wallis has been held by the Council and members of the Institution of Railway Signal Engineers, during the twenty-odd years that he has been a member and, particularly, the eleven years for which he has served as the Hon. Treasurer, was shown at the annual meeting on February 13, when he was made an Honorary Member of the Institution. Also, at the meeting in the afternoon, the Council presented him with a gold watch, suitably inscribed, and then, at the general meeting, he was given by the members, an autographed photograph of the "majority" year Council.

***Mr. Walter Eraut, C.B.E., M.Inst.C.E.,***
Chief Engineer (Contracts) to the Crown Agents for the Colonies, 1922-35

***Mr. W. L. Watson, Assoc.M.Inst.C.E.,***
Appointed Chief Engineer (Contracts) to the Crown Agents for the Colonies

The members of the Institution of Railway Signal Engineers will be glad to hear that Mr. T. S. Lascelles, who has just consented to serve as the Hon. Treasurer, has also agreed to continue his useful work of Hon. Librarian.

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From the *London Gazette* of February 15:—Engineer and Railway Staff Corps—Lt.-Col. M. T. Porter, M.C. (retired pay), to be Lt.-Col., July 26, 1934, with seniority June 15, 1925. Lt.-Col. Porter was formerly a Deputy Chief Engineer, Indian State Railways.

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INSTITUTION OF CIVIL ENGINEERS

The following were among the associate members elected and students admitted at an ordinary meeting on February 5:—

*Associate Members*

Messrs. C. Clark, G. Rushton and W. J. Syme, New Zealand Government Railways; E. W. N. Driver and J. G. Elliott (Harbours) and H. G. J. Seeliger (Railways) South African Railways and Harbours.

*Student*

Mr. S. Swarup, East Indian Railway.

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Viscount Knutsford, a Director of the L.M.S.R., left estate valued at £190,351 (£135,351 net).

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Consequent upon the retirement of Mr. W. A. Agnew, Chief Mechanical Engineer (Railways), London Passenger Transport Board, on Saturday, certain changes in the organisation of the department will be effective as from Monday, February 25. Mr. W. S. Graff-Baker has been appointed Chief Mechanical Engineer to succeed Mr. Agnew, and Mr. E. T. Brook, Superintendent of Rolling Stock, will have under his control, in addition to his present responsibilities, the maintenance and running of lifts, escalators, ventilating plant, and pumps. Mr. E. Graham, the Assistant Mechanical Engineer (Maintenance), in addition to his present duties, will be responsible for the inspection of materials other than for new works, and also for the general organisation of the clerical, costing and records staff of the department.

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INDIAN RAILWAY STAFF CHANGES

Mr. B. M. Crosthwaite, V.D., Agent of the Burma Railways, has been granted leave preparatory to retirement, with effect from March 1, and will be succeeded by Mr. J. E. M. Rowland, Officiating Chief Engineer of the system.

Mr. H. Jackson, Deputy Chief Mechanical Engineer, N.W.R., has been granted 17 months' leave preparatory to retirement as from March 12.

Mr. P. C. Chandhuri has been appointed to officiate as Deputy Chief Accounts Officer, E.B.R., as from January 12.

Mr. A. W. Parsons, Chief Transportation Superintendent and Traffic Manager, M. & S.M.R., has been granted eight months' leave as from January 8. Mr. R. de K. Maynard, Deputy Transportation Superintendent (Traffic), has been appointed to act in his place.

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We regret to note the death, on February 16, of Mr. J. W. Whittam, at the ripe old age of 94. Mr. Whittam was one of the oldest surviving officers of the Metropolitan District Railway. He was born at Kendal, Westmorland, in October, 1840, and began his railway career in Lancashire, before he came to London as a young man to take up an appointment at the Railway Clearing House. After serving on the Government Commission appointed in 1867 to investigate the state of railway affairs in Ireland, he became associated for brief periods with the former London Chatham & Dover and the Great Northern Railways. Mr. Whittam joined the Metropolitan District Railway when it commenced to operate as a separate undertaking, and was appointed Accountant to the company in 1884, a position which he held until his retirement in 1904.

Many of his former associates, including Mr. John Christopher Mitchell—whose own business career terminated with the liquidation of many undertakings now embodied in London Transport—attended Golders Green Crematorium on February 19 to pay their last tributes to this Grand Old Man of the railways, whose ashes were deposited at Finchley cemetery on the following day.

## G.W.R. Chief Goods Manager's Dinner

The value and success of inter-departmental co-ordination provided the keynote to the speeches at the annual staff dinner of the Chief Goods Manager's Office, Great Western Railway, which was held on Friday, February 15, at the Holborn Restaurant, under the chairmanship of Mr. A. Maynard, Chief Goods Manager. A very enjoyable evening was spent by a large and representative gathering, which included many past and present G.W.R. officers. Among those present were:—

Messrs. P. Boyle, R. Carpmael, R. Cope, F. C. A. Coventry, C. T. Cox, C. Finber, F. W. Hawkesworth, A. B. Holloway, F. W. Lampitt, J. F. Lean, J. W. Lovejoy, J. G. McBryde, G. Matthews, Jas. Paterson, H. W. Payne, P. W. Pine, F. R. Potter, A. S. Quartermaine, P. G. Robinson, R. G. Scarsbrook, F. P. Sealey, G. Stephens, B. F. Tee, G. J. Walker, H. Wheeler and J. R. C. Williams.

The toast of "The Chief Goods Manager and the Chief Goods Manager's Office" was proposed by Mr. B. F. Tee, who said he regarded it as symbolic that this toast should have been entrusted to a member of the road transport department staff. The main objective of them all was to win traffic back from the roads, and to assist in this work a small department was recently created for opposing road service licence applications. That department owed much of its success to the valuable support it received from other departments, and especially from the boldness, ingenuity, and energy of their Chairman of that evening and his staff. This was a spirit typical of the G.W.R. from its earliest days; recently he was looking up some of their historical notes, and found that when apparently insuperable physical difficulties were raised to the building of the South Wales line, their representative said they would "dam the rivers and blast the rocks." Mr. Maynard was a man of incredible activity, ever watchful of the interests of the great company they all served.

In reply, Mr. Maynard said it gave him great pleasure to see and welcome so many colleagues from other departments, especially Mr. James Paterson, who was now a member by marriage of their big family. As Mr. Cope was present he would be very careful in quoting figures, but he did not think anyone would dispute the statement that ever since 1867 the Goods Department had produced the larger part of the company's revenue. Their policy was, of course, the provision of even better service at lower overall cost, and he paid tribute to the loyal support he had received from his own staff during a difficult time. He was happy to say that the cloud of redundancy was now removed and the old rate of staff progress would shortly be resumed.

"The Visitors" was proposed by Mr. F. W. Lampitt, who emphasised that their wonderful success was due entirely to the great support received from all members of the family, many of whom they were glad to have with them as their guests, representing every department. Members of the railway press, also, were their very good friends and were always ready to assist by stressing the best side of things. He coupled the toast with the name of Mr. P. W. Pine of the legal department, who was now adding to his many past kindnesses to the staff by offering free legal advice through the medium of the *G.W.R. Magazine*.

Mr. Pine responded with some humorous reminiscences, and "The Retired Members" were then toasted by Mr. H. W. Payne. An excellent musical and entertainment programme was interspersed throughout the evening.

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B.S.S. FOR SOLID AND SPLIT TAPER PINS.—The British Standards Institution has just issued a revised edition of the B.S. specification for solid and split taper pins, No. 46, Part 3—1935. Copies may be obtained from the British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 2d. each, post free.

# Astonishing Locomotive Performance in France

(*See illustration on page* 336)

On pages 248-9 in our issue of February 8, we began, under this heading, a description of typical present-day French locomotive running, with particular reference to the modified P.-O. type engines. This description is now continued to cover runs on the Est, Etat, P.L.M., and Nord systems, the engines involved also being rebuilt on lines similar to those of the P.-O. Railway.

## Est

Remarkable results have attended the rebuilding of the old 4-6-0 locomotives on this line, which are now performing work little if at all inferior to that of the much larger and heavier 4-8-2 engines. The changes consist in the fitting to the l.p. cylinders of new piston-valves with double admission and exhaust passages, the original cylinders being retained. Steam pressure has been increased from 228 to 256 lb. per sq. in., and the h.p. cylinders have been lined up to a diameter smaller by 1·4 in. The equipment includes a trefoil blast-pipe of large cross-section and a feed-water heater. These 79-ton locomotives (the weight is 1 ton less than that of the Great Western Railway 4-cylinder 4-6-0 "Castles" and 6 tons less than that of the L.M.S. "Royal Scots") now show themselves capable of hauling a 380-ton train up a 1 in 125 gradient (equal in inclination to the 7 miles up to Shap station, L.M.S.R., on the northern approach to Shap summit) at 49 m.p.h., and of maintaining 70 m.p.h. on the level with a load of 600 tons. Similar reconstructions of 4-6-2 and 4-8-2 Est express locomotives are now in progress.

Out of Paris No. 3264, one of the rebuilt 4-6-0's, with an eight-coach train of 380 tons, passed Noisy-le-Sec, 5·5 miles, in 9 min. 42 sec., and covered the ensuing 35·0 miles to La Ferté-sous-Jouarre in 31 min. 46 sec., maintaining 62 m.p.h. up a short length of 1 in 200. A bad permanent way check followed, causing 5 min. loss, but Châlons-sur-Marne, 106·9 miles, was passed in 107 min. 20 sec. Cut-off to this point had been mostly 28 per cent. in the h.p. and 48 per cent. in the l.p. cylinders. Between Châlons and Vitry-le-François the train was twice stopped by adverse signals, and the driver then set out successfully to recover all the lost time. Cutting-off at 35 per cent. in the h.p. cylinders he maintained 66 m.p.h. up 1 in 400; and then, with a h.p. cut-off of 48 per cent. and a l.p. cut-off of 55 per cent., he mounted the 6¼ miles at 1 in 125 to Loxéville at a minimum of 49 m.p.h. Bar-le-Duc, 157·4 miles, was passed in 171 min. 25 sec.; Lérouville, 179·3 miles, in 192 min. 47 sec.; Toul, 198·3 miles, in 211 min. 5 sec., and Nancy, 219·0 miles, was reached in 231 min. 10 sec. Schedule is 235 min., but the net time was only 211¼ min.

In the reverse direction, on a non-stop run from Bar-le-Duc to Paris, No. 3240 had an eleven-coach train of 510 gross tons. The 43·5 miles between km. posts 244 and 174 were run in 37 min. 13 sec., at an average of 70·1 m.p.h., and again from posts 158 to 74 52·2 miles were run in 45 min. 12 sec., at an average of 69·3 m.p.h., on practically level track throughout. A maximum of 71·5 m.p.h. was reached on the level with a cut-off of 35 per cent. in the h.p. and 52 per cent. in the l.p. cylinders. Vitry-le-François, 30·2 miles, was passed in 29 min. 33 sec.; Châlons (at 34 m.p.h., service slack), 50·5 miles, in 47 min. 25 sec.; Epernay, 69·6 miles in 66 min. 53 sec.; and Chateau-Thierry, 98·7 miles, in 91 min. 55 sec. A bad permanent way check followed, costing 6 min., but speed soon rose again to a sustained 75 m.p.h., La Ferté, 116·9 miles, being passed in 112 min. 7 sec.; Lagny, 140·4 miles, in 133 min. 33 sec.; and Noisy, 151·9 miles, in 144 min. 5 sec. But there was a further loss of 5 min. by signals approaching Paris, and the total time for the 157·4 miles was thus 156 min. 10 sec., though the net time was 145¼ min. only. The fastest schedule of the day from Bar-le-Duc to Paris is 155 min., but the booking of this particular express is 164 min.

The same engine on another occasion had a 13-coach train of 620 tons to haul from Bar-le-Duc to Paris and passed Vitry in 32 min. 27 sec., Châlons in 50 min. 14 sec., Epernay in 69 min. 11 sec., and Chateau-Thierry in 95 min. 30 sec. The same permanent way slowing (in this case costing 5¼ min.) was made near Nanteuil, but Meaux, 130 miles, was passed in 130 min. 44 sec., and Paris would have been reached in 159¼ min. but for severe signal checks outside. By diversion to the slow tracks out of Bar-le-Duc, 2¾ min. had been lost, so that the net time for the run was 151¼ min.—an astonishing achievement for a 79-ton locomotive with a 620-ton train, even though all allowance be made for the easy route. Cutting-off at 40 per cent. in the h.p. and 50 per cent. in l.p. cylinders the engine ran freely on the level at 65 to 70 m.p.h., and the speed at no point exceeded 72 m.p.h. Allowing for the 40 m.p.h. slack through Châlons, the locomotive covered 100 miles with this load at an average of 67 m.p.h. Yet the coal consumption, inclusive of a certain proportion of slack, only averaged 45 lb. per mile.

## Etat

On the Etat system the rebuilding is almost complete of 85 4-cylinder compound Pacifics, on the same general lines as the Paris-Orleans conversions. These changes include the provision of new h.p. steam-pipes, new l.p. cylinders with enlarged steam-pipes (the original h.p. cylinders being retained), and also Kylchap double blast-pipes, and Houlet superheaters. Some of these engines have l.p. piston-valves of the Willoteaux type with double exhaust and admission passages, some are fitted with Renaud poppet-valves, and some, like the P.-O. rebuilds, have Dabeg O.C. poppet-valves. An engine of the last-mentioned type, No. 231.777 D, with a 374-ton train, performed some remarkable work on the Paris-Cherbourg line, especially in rapid starting and uphill performance. As far as Mantes-Gassicourt, where the Cherbourg line diverges from that to Havre, and a service slack is enforced, the gradients are inconsiderable, but from there onwards they are severe. The time taken to pass Mantes, 35·6 miles from Paris (St. Lazare) was 41 min. 7 sec., but only 36¾ min. net, because signal checks had been experienced between Sartrouville and Les Mureaux, and a permanent way slowing before Mantes, where speed was reduced to 45 m.p.h.

There next follows an ascent of 10 km. (59-69) at 1 in 111 up; this was surmounted at an average of 46·6 m.p.h., with a minimum of 46 m.p.h.; at Beuil the maximum speed was 75 m.p.h., and the lowest rate up the 11½-mile bank to St. Aubin, ranging in steepness from 1 in 200 to 140, was 55 m.p.h. The 31·1 miles from Mantes-Gassicourt to Evreux stop were thus run in 33 min. 51 sec., and Evreux, 66·7 miles from Paris, was reached in 74 min. 58 sec., or 70½ min. net. Between Evreux and Lisieux there are summits at Romilly and St. Mards, approached by banks 10½ and 12 miles long respectively, the former steepening from 1 in 200 to 1 in 143, on which the minimum speed was 53 m.p.h., and the latter from 1 in 200 to 1 in 125, where speed fell to 41 m.p.h., but in this case after a severe signal check had been experienced at the foot of the bank. The 51·5 miles from Evreux to Lisieux were thus run in 57 min. 51 sec., or 55 min. net. Out of Lisieux, practically from the start, there is a lengthy ascent at 1 in 100; up successive kilometres of this climb speeds were 25, 31, 36, 39, 41, 43, and a maximum of 43·5 m.p.h., the summit, 4·0 miles from the start, being attained in 8 min. 31 sec. At a later stage 37 km. (23·0 miles) between posts 200 and 237, of undulating line, were run at an average of 72·6 m.p.h., with a maximum of 77 m.p.h., and Caen, 29·9 miles from Lisieux, was reached in 31 min. 56 sec., start-to-stop, despite the initial ascent. The engine thus achieved a net gain of 6½ min. from Paris to Evreux, 4 min. thence to Lisieux, and 3 min. from Lisieux to Caen, 13½ min. in all. As regards maximum loading on the Etat, during the past summer the night express to Lannion (No. 599) was made up to

878 tons and worked by a 4-8-2 with assistance.

### P.L.M.

On the P.L.M. system the revolutionary increases which have taken place in the speed of the day trains over the principal main line between Paris, Dijon, Lyons, Marseilles, and the Riviera, is a matter we have referred to from time to time as it has developed. Over the heavily-graded section between Laroche and Dijon, which includes Blaisy-Bas summit, and also east of Marseilles, the A Class Mountain (4-8-2) type engines are chiefly responsible for the workings, and are limited to a maximum speed of 100 km. (62 m.) p.h. Elsewhere the standard Pacifics still undertake the haulage almost exclusively. Variants of the original Class D are Class F, with lengthened valve-travel, A.C.F.I. feed-water heater and Dabeg economiser, of which No. 231.F.141 has a boiler pressed to 285 lb. per sq. in., new cylinders, enlarged steam-pipes, and a double chimney; and Class G, which is similar to Class F but with the addition of double trefoil blast-pipe, double chimney and improved lubrication.

A good example of the work of the "G" class, furnished by Baron Vuillet, was a run from Dijon to Laroche with a train of 399 tons. Out of the ascent of 16·4 miles from Dijon to Blaisy-Bas, 9·3 miles are inclined at 1 in 125, and the remainder chiefly at 1 in 250; nevertheless Plombières, 2·8 miles, was passed in 5 min. 18 sec., at 53·5 m.p.h., and Velars, 5·5 miles, in 8 min. 25 sec., with a minimum on the 1 in 125 of 47½ m.p.h. A permanent way check costing 3 min. was now experienced on the upper part of the bank, so that the 16·4 miles from Dijon to passing Blaisy-Bas took 24 min. 10 sec. On the falling grades from Blaisy to Les Laumes there is a limitation of maximum speed owing to curves, but from there onwards the statutory maximum of 74½ m.p.h. was frequently attained, and Laroche, 99·1 miles from Dijon, was reached in 102 min. 12 sec. (including 2½ min. loss by a p.w.r. check), or 96¾ min. net., the timetable allowing 108 min.

From Laroche to Paris the experimental F class 4-6-2 No. 231.F.141 on another occasion made a fine run with a train of 453 tons, and showed its ability to travel continuously on the level at 73 to 76 m.p.h. with this load. Out of Laroche, St. Julien, 12·6 miles, was passed in 14 min. 6 sec.; Sens (where speed was reduced to 56 m.p.h.), 26·3 miles, in 25 min. 58 sec.; Villeneuve-la-Guyard, 40·9 miles, in 38 min. 27 sec.; and Montereau (with another reduction to 56 m.p.h.), 47·5 miles, in 44 min. 5 sec. To this point the line is practically level, but there are subsequently some rising grades past Moret, on which the speed, after a recovery to 69 m.p.h. from Montereau, fell to 62 m.p.h. minimum up 1 in 200, rising again to 74½ m.p.h. before a reduction to 43 m.p.h. was made through Melun. Fontainebleau, 59·7 miles from Laroche, was passed in 55 min. 23 sec., and Melun, 68·8 miles, in 63 min. 40 sec. From Melun slack the engine attained 61 m.p.h. up a grade of 1 in 250 with this 453-ton train, and passed Cesson, 72·8 miles, in 68 min. 25 sec., so making possible a time of 94 min. for the 96·3 miles from Laroche to Paris, but this recovery, after a late start, of 14 min. on schedule, was almost entirely wiped out by a series of signal stops between Cesson and the Gare de Lyon.

Some notable work is also performed with the principal express trains on the extremely difficult main line from Paris to Nevers and Vichy, which abounds with severe service slacks and heavy gradients. With a train of 424 tons, 4-6-2 No. 231.G.256 regained 12 min. from Nevers to Paris, and the performance included the ascent of 2 miles at 1 in 125 before La Charité at a minimum of 64 m.p.h., and 3 miles at 1 in 166 up to Gien at a lowest speed of 68½ m.p.h.; while from Melun slack (43 m.p.h.) an acceleration was noted to 64½ m.p.h. up 1 in 250. Three separate stages of the run, 16·8, 30·6, and 13·1 miles in length, were covered at respective average speeds of 72·0, 73·0, and 73·4 m.p.h. This was on Train No. 1004. In the reverse direction Train No. 1003 was worked by 4-6-2 No. 231.G.259 from Montargis to passing Gien, with an adverse difference in altitude of 239 ft., in 23 min. 25 sec. start-to-pass for the 22·7 miles, with a load of 384 tons; later, 8·4 miles of up grades, ranging from 1 in 250 to 1 in 166, were covered at an average of 66·5 m.p.h., with a minimum of 64½ on the 1 in 166. No. 231.F.235, with a heavier train of 601 tons, covered the 22·7 miles from Montargis to Gien, including the 239 ft. rise, in 27 min. 40 sec. start-to-stop, with a minimum speed of 53½ m.p.h. up a short length of 1 in 166 gradient. Some of the hardest locomotive work on the P.L.M. system is performed over this Bourbonnais main line.

### Nord

No data are yet to hand as to the performance of the rebuilt P.-O. Pacifics, which have been transferred to the Nord, over the latter's system, but the work of the standard Nord super-Pacifics with extremely heavy trains is, of course, a matter of common knowledge. A comprehensive article on current Nord locomotive work appeared in the October, 1934, issue of our monthly contemporary, *The Railway Magazine*, and contained some outstanding examples of heavy load performances. Super-Pacific No. 3.1254, for example, with the 10.30 a.m. out of Paris, made up to 600 gross tons, averaged 58·6 m.p.h. for 14·6 miles from St. Denis to Survilliers, almost entirely up at 1 in 200, and 58·1 m.p.h. up the 23·0 miles from Creil to Gannes, of which roughly one-third is at 1 in 250, and the remainder from 1 in 300 to 500 or flatter. Over the level 22·0 miles from Ailly-sur-Somme to Abbeville an average of 68·8 m.p.h. was maintained, and it was only from Abbeville onwards that the efforts of the locomotive were somewhat relaxed, this initial 108·9 miles, including the dead slowing through Amiens, having been covered in 105 min. 54 sec. Etaples, 140·6 miles from Paris, was reached in 137 min. 43 sec., and the 129·7 miles from St. Denis to Rang-du-Fliers-Verton, including Survilliers and Gannes summits and Amiens slack, were run at an average of 63·3 m.p.h.

In the reverse direction, with the south-bound Golden Arrow, No. 3.1230 worked a 465-ton train over the 184·1 miles from Calais to Paris in 185 min. 28 sec., notwithstanding two bad permanent way slowings, which left a net time of 177¾ min. The 9 km. between posts 287 and 278, which constitute the final stage of the 7-mile ascent from outside Calais to Caffiers—corresponding exactly in length and inclination with the northern ascent of the L.M.S.R. to Shap station—were run at an average speed of 50·7 m.p.h., and this almost immediately after the engine had started "cold" from Calais Maritime. From Longueau up to Gannes, 24 miles which include 12 miles at 1 in 333 and 4 miles at 1 in 250 against the engine, the time was 22 min. 18 sec., and the average speed 64·6 m.p.h. The 163·4 miles from Marquise-Rinxent to St. Denis were run in 155 min. 19 sec., or 150 min. net (including Amiens slack)—an overall average of 65·4 m.p.h. With 550 tons No. 3.1230 made the same run in 186 min. 39 sec., or 183½ min. net. In this case the minimum speeds were 39 m.p.h. on the 1 in 125 to Caffiers, 47½ m.p.h. on the 3 miles at 1 in 133-143 to Neufchatel, 59 on the final 1 in 250 of the long ascent to Gannes, and 55½ up the 11 miles at 1 in 200 up to Survilliers. The 46·6 level miles from Rang-du-Fliers-Verton to Ailly-sur-Somme were run in 40 min. 42 sec., at an average of 68·7 m.p.h., and the 168·9 miles from Caffiers to St. Denis in 162 min. 14 sec., or 158¾ min. net—an overall average of all but 64 m.p.h. with this 550-ton load. As regards freight haulage on the Nord, the new 2-10-0 locomotives of the 5.1200 series are hauling coal trains of 2,165 tons (2,200 metric tonnes) from Lens to Paris.

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COAL-BURNING APPLIANCE MAKERS' ASSOCIATION.—A provisional schedule issued by the above association shows that manufacturers of the following types of traction equipment are eligible for membership :—

*Class A.*—Boilers, Railway Locomotive—all types of boiler for railway locomotives ;

*Class B.*—Furnaces—reciprocating, rocking, self-cleaning, and all other special types of grate for railway locomotives ;

*Class C.*—Road Vehicles—boilers with firing equipment for steam wagons and tractors ;

*Class D.*—Agricultural Machinery—all types of steam-driven agricultural machinery, both stationary and mobile ; and

*Class E.*—Contractors Equipment—road rollers, steam shovels, draglines, conveyors, stationary haulage plant, cranes, dredgers, &c.

XUM

## Institute of Transport Dinner

The annual dinner of the Institute of Transport was held at the Connaught Rooms in London on February 15 under the chairmanship of the President, Mr. Sidney E. Garcke. Among those present were:—

Lt.-Col. J. Sandeman Allen, Messrs. A. L. Barber, Hugh Beaver, R. F. Bushrod, A. S. Cardew, A. L. Castleman, W. Challis, A. R. Cooper, E. C. Cox, C. R. Dashwood, R. G. Davidson, G. Cole Deacon, G. H. Hare Dean, James France, Prof. H. S. Frankel, Mr. W. H. Gaunt, Sir Alexander Gibb, Messrs. C. le M. Gosselin, K. Grand, A. Winter Gray, H. N. Gresley, D. Halliwell, A. E. Hammett, W. A. Jepson, G. B. Lissenden, E. F. E. Livesey, M. G. J. McHaffie, G. G. Mitcheson, Lt.-Col. A. H. L. Mount, Sir David Owen, Mr. J. Pike, Lt.-Col. F. Rayner, Sir Richard Redmayne, Messrs. C. W. Reeve, V. A. M. Robertson, C. J. Selway, Lt.-Col. F. C. Shelmerdine, Messrs. C. E. R. Sherrington, H. A. Short, Roger T. Smith, Major Malcolm Speir, Sir John J. Stavridi, Messrs. Gilbert S. Szlumper, T. E. Thomas, Professor W. M. Thornton, Sir John Thornycroft, Sir George Wyatt Truscott, Messrs. R. Twining, H. G. Williams, and W. V. Wood.

Mr. L. Hore-Belisha, M.P., Minister of Transport, proposing the toast of "The Institute of Transport," remarked upon the scope of the transport industry of this country, in which, besides airways and waterways, there were 177,000 miles of roads and 20,000 route miles of railways, representing £2,000,000,000 of capital and employing 2,000,000 persons—one-sixth of the whole working population, a greater number than in any other industry. All these methods of communication it was the function of the Ministry of Transport to co-ordinate and harmonise for the national weal. How different the present situation would have been if some directing force had from the beginning taken a comprehensive view of our communications. We should not have had first the roads sacrificed to the waterways, then the waterways sacrificed to the railways, then the railways, as it had been claimed, sacrificed to the roads. The significance of the Ministry of Transport lay in its guarantee to the future that those errors should not be repeated. In giving every possible stimulus to each form of transport, to fulfil the function which it could economically perform, its separate development must be related to the whole.

The most hopeful tendency in transport today was the manner in which each branch was trying, not so much to take from the other, as to learn from the other. Recent road developments had taught the railways much, and on the other hand the roads still had much to learn from the railways. Already they were copying from the railways signalling, and they were about to follow them in the segregation of traffic. There was also an analogy for the pedestrian crossing, and next week he proposed to institute an experiment, based on railway practice, of barriers to provide against foot passengers stepping into the main thoroughfare at busy junctions. When driving tests were introduced in April, it would merely be an assertion of the principle the railways had observed in regard to their drivers. For long, inquiries had been held into every fatal accident on the railways, an example that had not yet been followed by the roads.

In one respect railways had a supreme advantage over roads in that they were under a central directive control which made possible uniformity of gauge and other features. Mr. Hore-Belisha would make it his endeavour to help highway authorities to overcome the lack of uniformity from which they suffered. In this endeavour he anticipated the working together of the Institute and the Ministry, the Institute being the reflective element and the Ministry the active element.

Mr. Sidney E. Garcke, replying to the toast, referred to the phenomenal success of the Institute of Transport, which in its short life had already contributed largely to making transport a profession, though not yet so exclusive a profession as Medicine, the Law or the Stock Exchange, all of which bodies made a rule that members should not indulge in personal advertisement. The Institute of Transport had not such a rule. The time had not arrived when we could place our beacons under bushels. The endeavour of the Institute was to co-ordinate transport, and to this end its essential function was transport education. Its activities extended over the whole English speaking world. It had a strong students' and graduates' section which was fast breaking down the barriers of limited knowledge of the subject of transport. Transport was a new science, and the modern explorer on his return was no longer in the dilemma of Columbus who, when he set out on his voyage of discovery, did not know where he was going, and when he got back did not know where he had been.

The biggest development in transport began in 1910, when King George V ascended the throne. This year, to mark the occasion of the Jubilee of the King's reign, a loyal address would be presented to His Majesty by the Institute of Transport.

Sir Josiah C. Stamp, in proposing the toast of "Our Guests," said that the Institute of Transport was a place where lions and lambs would lie down together. As an example he mentioned that the railways would not for a moment consider the abolition of the roads, which were necessary to enable people to get to stations. The members were particularly pleased to welcome the Austrian Minister, in view of the forthcoming summer visit of the Institute to his country. Among other distinguished guests were Mr. C. W. A. Scott and Mr. T. Campbell Black, who had set up the recent wonderful record in air transport whereby Australia had been brought within three days of England.

Baron Georg Franckenstein, the Austrian Minister in London, responding, said that he was sure that the members of the Institute would receive a warm welcome from Austria when they assembled there in congress in May. He was sure, too, that they would have an enjoyable and interesting time. Viscount Goschen, Chairman of the Transport Advisory Council, also replied.

## Labour in the Transport Industry

On Tuesday Mr. John Cliff delivered a lecture to the Institute of Transport on the methods of negotiation between transport undertakings, their employees, and the trade unions. Confining his attention to rail and road transport, he outlined the developments of the past thirty years and "revolutionary change in relationships" between employers, workers, and unions during that period. In the main he offered no views or comments and contented himself with a plain narrative which is very useful as a concise work of reference. He added, however, that the trade unions, in the conduct of negotiations and arbitrations, had, at times, had occasion to consider and examine the general policy, the administration, and the financial position of transport undertakings, with the result that they had felt compelled to challenge the policy pursued by these undertakings. The demand of the workers was increasingly for an improved collective status in the service in which they were engaged, and for a collective, effective, and responsible share in the government of the service. By co-operation, transport executives had nothing to lose and everything to gain. He asked his audience to consider the general statement of the objects of the National Joint Industrial Council of the Tramway Industry: "To secure the largest possible measure of joint action between employers and employees by the regular consideration and settlement of matters affecting the well-being and progress of the industry as part of the national life." He said that the rate of future progress depended a great deal on the willingness of transport executives to give effect to that declaration. The improved relationship already secured was sufficient justification for further advance for the establishment of joint standing machinery in all transport organisations.

TRIAL EASTBOURNE ELECTRIC TRAIN, SOUTHERN RAILWAY.—On Sunday, February 17, the first trial run was made of an electric train from Brighton via Lewes to Hampden Park. The train consisted of two new two-car corridor units.

# Birmingham Railway Carriage & Wagon Co. Ltd.

## Mr. Bernard Docker on the Importance of Export Trade

Mr. B. D. F. Docker, J.P. (Chairman) presided at the 81st annual general meeting of the Birmingham Railway Carriage & Wagon Company, which was held on Tuesday, at Smethwick, Birmingham. In the course of his speech, he said:—

I am sure you will all share our sorrow in the great loss we have sustained by the death, since I last addressed you, of our friend and colleague Sir Harris Spencer. During the 17 years that he was a member of this board Sir Harris gave his wholehearted help; he was a man of sound experience and ability, an outstanding personality, who earned the respect and affection of all, and is greatly missed.

I do not think it is within the memory of any of our present shareholders that a loss has previously been recorded as a result of a past year's working, and I very much regret that this record has been interrupted. It is some consolation to know, however, that we are able to retain another record by recommending the payment of a dividend, and so preserve unbroken continuity since the company came into existence in the year 1855.

The payment of this dividend entails drawing on the general reserve fund. Before coming to this decision your board gave very careful consideration to all the circumstances, and were influenced by the strong financial position they were in by having ample cash available to meet any needs. The building up of this reserve fund was a course dictated by caution and has resulted in our strong position to-day even after several years' severe struggle. It proves the justification of the policy we have pursued in the past in husbanding our resources.

The explanation of the loss made last year is to be found in the lack of demand for new rolling stock. On the last three or four occasions when I have addressed you I have stressed the importance of export orders. A few years ago orders from overseas provided from 50 per cent. to 75 per cent. of the whole of the output—the bulk of the work coming from India and South America. There have been practically no orders from either of these countries for several years past, owing to falling traffics, currency difficulties, and restrictions. Moreover, there is an ever-growing tendency to develop manufacture at home in the various countries; this is particularly the case in India, where bounties are offered to local firms and heavy duties imposed on imported manufactured articles. We manufacturers ask for nothing more than the chance to compete under fair conditions, and I may add that, speaking for this company, I am convinced we would be able to compete successfully.

### Competition for Overseas Business

For the small amount of work that is inquired for from abroad we usually have to meet world-wide competition, often from countries where the standard of living is much lower than here, and, in addition, a more heavily depreciated monetary exchange or a Government subsidy often further assists our foreign competitors in securing orders.

The total output for 1934 was substantially greater than that of 1933, due chiefly to some very welcome orders we received from the home railways in the early part of the year. These orders, which were principally for passenger stock, were required for quick delivery in order to be ready for the summer traffic. To secure this work we had to meet keen competition not only from other builders here, but from the railway companies' own workshops, and to meet a price which the latter regard as their cost.

In the course of the year's work we, I think, achieved something of a record. We received an order from the South African Railways in August last for 20 first class sleeping carriages, and it was not until the 23rd of that month that all the necessary information was in our possession to enable us to proceed. Nevertheless, our first shipment was ready by November 5, and the whole of the 20 coaches were delivered in South Africa and placed in service before last Christmas. These sleeping coaches were of complicated and intricate construction, and we were complimented by the South African railway authorities for the manner and expedition with which we executed the order. It is very gratifying to know, notwithstanding the difficult conditions and low prices prevailing, that we continue to maintain the high reputation we have always enjoyed for workmanship and general excellence of our manufactures. The high standard of our workmanship should commend consideration in comparing quotations, since the upkeep of high-class rolling stock is practically nil.

### More Work in Hand

I am not going to attempt to be prophetic as regards the future. The value of the orders on our books now is greater than it was at this time last year, but it is somewhat of an anomaly that although there is a slightly improved demand for rolling stock there has been no such improvement in the prices obtainable which we are entitled to expect, but on the contrary they are at an even lower ebb. We can only hope that it will not be long before a change for the better takes place.

I cannot conclude my remarks without once again stressing the importance of our export trade, and I still cherish the hope that something may be done to restore this. With our rapidly increasing imports it ought not to be difficult to insist upon a *quid pro quo* from those from whom we buy. We ought to exact from those countries from which we purchase such large quantities of agricultural and other produce that they in return will purchase from us manufactures of the heavy industries such as rolling stock and machinery.

# Forthcoming Meetings

Feb. 22 (*Fri.*).—**Mersey Railway,** (Ordinary General), Winchester House, Old Broad Street, E.C. 2, at 12 noon.

Feb. 23 (*Sat.*).—**Great Southern Railways** (Nomination of Directors), Kingsbridge Station, Dublin, from 10 a.m. to 4 p.m.

Feb. 25 (*Mon.*).—**Manchester Ship Canal Company** (Ordinary General), Milton Hall, Deansgate, Manchester, at 11 a.m.

Feb. 26 (*Tues.*).—**Liverpool Overhead Railway** (Ordinary General), India Buildings, Water Street, Liverpool, at 12 noon.

Feb. 27 (*Wed.*).—**Great Northern Railway Company (I.),** (Ordinary General), Gresham Hotel, Upper O'Connell Street, Dublin, at 12 noon.

Feb. 27 (*Wed.*).—**Great Western Railway** (Annual General), Paddington Station, W.2, at 11.30 a.m.

Feb. 28 (*Thurs.*).—**Guernsey Railway** (Ordinary General), Guernsey, at 3 p.m.

Feb. 28 (*Thurs.*).—**Southern Railway** (Annual General), Southern House, Cannon Street Station, E.C., at 11.30 a.m.

Feb. 28 (*Thurs.*).—**Dundalk, Newry & Greenore Railway** (Ordinary General), Euston Station, N.W.1, at 12.30 p.m.

Feb. 28 (*Thurs.*).—**Belfast & County Down Railway** (Ordinary General), Company's Terminus, Queen's Quay, Belfast, at 11.30 a.m.

Mar. 1 (*Fri.*).—**London Midland & Scottish Railway** (Annual General), Friends House, Euston Road, N.W.1, at 11.30 a.m.

Mar. 8 (*Fri.*).—**Great Southern Railways** (Ordinary General), Gresham Hotel, Upper O'Connell Street, Dublin, at 2 p.m.

Mar. 8 (*Fri.*).—**London & North Eastern Railway** (Ordinary General), Hotel Great Central, Marylebone, N.W.1, at 2 p.m.

Mar. 29 (*Fri.*).—**Zafra & Huelva Railway** (Ordinary General), Calle de Ayala 54 Bajo Derecha, Madrid, at 5 p.m.

STEEL BARS FOR MACHINED PARTS.—The British Standards Institution has just issued B.S. specification No. 32-1935 for steel bars for the production of machined parts for general engineering purposes (suitable for automatic, semi-automatic and turret lathes). Copies may be obtained from the British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 2d. each, post free.

XUM

# Railway Collection and Delivery Services

On Thursday of last week Mr. A. E. Hammett, Assistant (Rates and Fares), Traffic Manager's Department, Southern Railway, gave the Railway Students' Association of the London School of Economics a comprehensive survey of the collection and delivery services of the main line railways, with especial reference to London. Until his recent appointment (recorded on page 905 of THE RAILWAY GAZETTE of November 30 last), Mr. Hammett was Assistant (Road Transport) to the Superintendent of Operation, and therefore was able to speak with considerable and detailed personal knowledge.

At the outset he pointed out that whereas details of the plan of organisation of each of the four group railways differed somewhat, each conformed to the theory (and was so applied in practice) that the cartage service in all its phases must be closely associated with the function of the Traffic Department. After detailing the routine of a London depôt and showing that limitations of space and layout resulted in many modifications in procedure, Mr. Hammett said that prior to the grouping of the railways in 1923 there were nine main line companies operating cartage services at seventeen London goods depôts, whereas today the number of companies had been reduced to four and the depôts to sixteen, the Southern Railway having amalgamated the old L.B. & S.C.R. Willow Walk and S.E. & C.R. Bricklayers' Arms depôts into one, adopting the latter name for the joint station.

Each of these depôts generally served a different part of the country, and when worked by separate companies each looked after its respective traffics. Therefore, as many as nine vehicles would possibly be calling daily on the same traders. The great problem which had beset the London companies since the amalgamation was to meet the request of traders for one van only to represent each group railway. Some of the depôts were miles apart and situated north, south, east, and west, and the proposition to amalgamate traffic was not quite as easy as might at first appear.

The bulk of the collections were made between the hours of 3.0 p.m. and 6.0 p.m., and therefore it would not be practicable for all railway vehicles to collect traffic for all sections, as this would involve double handling and double cartage. For example, assuming a van delivering goods from Bricklayers' Arms collected traffic for despatch to Bournemouth, Plymouth, Ramsgate, and Brighton, and a van from Nine Elms collected consignments for the same destinations, the result would be unloading at the home depôt, sorting, re-loading, and transferring across to the correct forwarding station. The traffic would not be handled and transferred in time to make train connections, apart from the additional cost that would be involved.

London cartage was a very expensive service owing to the enormous area to be covered, the large number of calls to be made, the miscellaneous character of the traffic, congestion in the streets and detentions at markets, wharves, docks, and warehouses. It was therefore necessary to have some system of control, and in 1934 the Southern Railway introduced a scheme of centralised control of all London goods cartage, the fundamental principles of which were: (1) to bring together cartage plant and traffic with a minimum mileage; and (2) to provide loads for vehicles which would otherwise be travelling empty and to transfer vehicles not required at one depôt to another point where work is available.

The central control office was staffed with a Chief Controller, three telephone control clerks, correspondence clerks and outdoor supervisor inspectors. The main stations were known as sub-control offices. A private telephone service was installed in the central office, which was connected with all sub-control offices, non-rail connected depots and markets, enabling the Chief Controller to hold a conference with all at one time, or speak to each individually. Post Office telephones were also installed in the control room, in order that drivers could report for instructions when not fully loaded. The control office was provided with a large map of the London cartage area, and also a blackboard of the same dimensions, both of which were divided into one mile numbered squares, each subdivided into four lettered squares. Each vehicle was identified by a prefix letter and number and represented by a coloured disc to indicate the depot to which it belonged. By means of detailed information supplied by station sub-controllers, the controller was in a position to know what vehicles were engaged and where, and the number of vehicles standing waiting for work throughout the day.

Each driver employed on regular house to house deliveries and collections was provided with a series of public telephone call offices with instructions to report to the Controller any inability to deliver traffic, stating reason; particulars of collections which could be operated; when only partly loaded; and breakdowns or mishaps. Receiving depots and market offices must telephone to the central control office particulars throughout the day of traffic on hand for cartage to main depots, and also particulars of carmen and motor drivers reporting for work.

Mr. Hammett then dealt with the nature and preparation of essential statistics which assisted a cartage controller in his most important function, namely, to keep a tight grip on the cost per ton. It was necessary for him specially to scrutinise the daily operating details, such as the average weight per load, and per horse and motor per day. If there was the slightest falling off in any of these, the cost per ton would automatically rise, which was an indication that either there was too much strength for the tonnage available, or a weakness in the organisation.

In conclusion, he emphasised that the scheme was operating satisfactorily and he believed the time would come, and in the fairly near future, when the cartage services in London of the four group railway companies would be centralised under one control. This point was taken up by various speakers in the subsequent discussion, and without committing himself as to details, Mr. Hammett replied that many discussions had taken place; that common user of all railway cartage vehicles in the London area already existed and was increasing; and that in his opinion this would spread until unified and centralised control came naturally and almost inevitably.

## Forthcoming Events

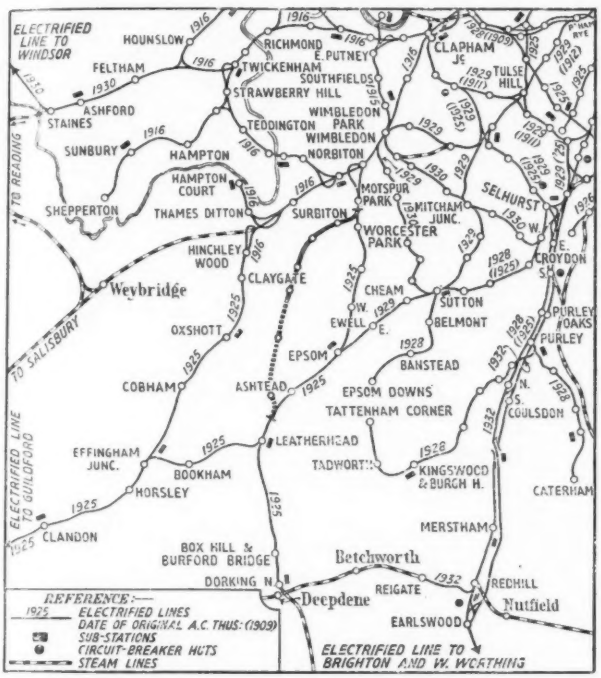
Feb. 22 (*Fri*).—Institution of Mechanical Engineers, Storey's Gate, London, S.W.1, 5.30 p.m. Annual General Meeting.
Railway Club, at Royal Scottish Corporation, Fleur-de-lis Court, London, E.C.4, 7.15 p.m. Annual General Meeting.
Feb. 22–3.—G.W.R. (London) Operatic Society, at New Scala Theatre, Charlotte Street, W.1. "Jolly Roger."
Feb. 25 (*Mon.*).—Institution of Mechanical Engineers (Graduate), Storey's Gate, London, S.W.1, 6.45 p.m. "Some Aspects of Workshop Costing," by Mr. S. W. Lister.
Feb. 26 (*Tues.*).—Institute of Transport (Birmingham Graduate), at Imperial Hotel, 6.30 p.m. "Some Developments and Consequent Advantages in Transport by Rail," by Mr. D. J. Doley.
L.N.E.R. (Middlesbrough) Lecture and Debating Society, at Cleveland Scientific and Technical Inst., Corporation Road, 7.15 p.m. "Drikold," by Mr. Fisher.
Permanent Way Institution (Scottish), at Royal Technical College, George Street, Glasgow, 7.15 p.m. "Permanent Way for a Modern Tramway System," by Mr. L. C. Greig.
Feb. 27 (*Wed.*).—Institution of Civil Engineers, at Savoy Hotel, London, W.C.2, 7.15 for 7.45 p.m. Annual Dinner.
Institution of Welding Engineers (North-Western), at Manchester College of Technology, 7.30 p.m. "How Welding has Displaced Castings in Manufacture by Fabrication," by Mr. J. Sadler.
L.N.E.R. (Newcastle and Sunderland) Lecture and Debating Society, at Sunderland, 7 p.m. "Competition in Transport," by Mr. J. Hancock.
Feb. 28 (*Thurs.*).—Institution of Locomotive Engineers (London), at Inst. of Mechanical Engineers, Storey's Gate, S.W.1, 6 p.m. "High Speed and the Steam Locomotive," by Dr.-Ing. eh R. P. Wagner.
L.N.E.R. (York) Lecture and Debating Society, at Railway Inst., Queen Street, 7 p.m. "Working of New Up and Down Yards, Whitemoor," by Mr. R. Gardiner.
Mar. 1 (*Fri.*).—Institute of Transport (Leeds), at Town Hall, 6.30 p.m. "The Working of the South Wales Docks," by Mr. L. E. Ford.
Institution of Locomotive Engineers (London), at Trocadero Restaurant, Shaftesbury Avenue, W.1, 6.30 for 7 p.m. Annual Dinner.
L.N.E.R. (King's Cross) Literary Society, at Queen's Hall, Langham Place, London, W.1, 7.30 p.m. Smoking Concert.

# New Southern Railway Line to Chessington

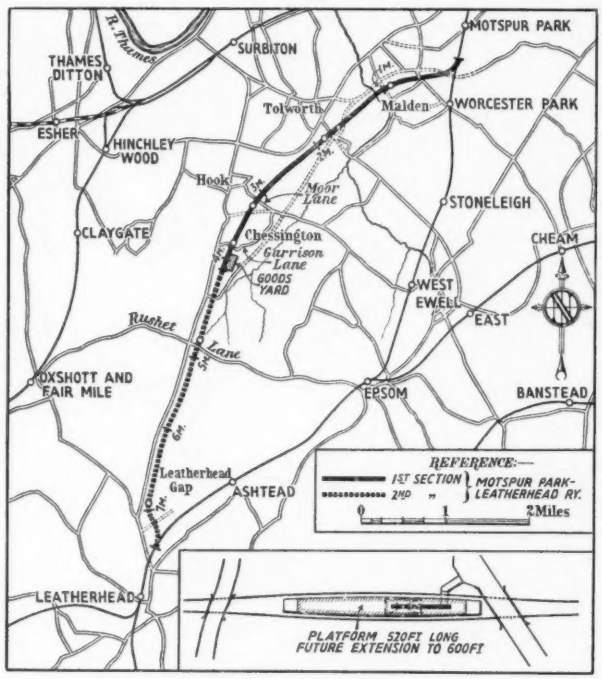
The report of the Southern Railway for 1934 announces that construction of a railway, about 4 miles long, from Motspur Park to Church Lane, Chessington, will be begun shortly. This line is Section 1 of railway authorised by the Southern Railway Company's Act of 1930 from Motspur Park to Leatherhead. Formal consent of the London Transport Standing Joint Committee has not yet been given, but is anticipated in the near future. This consent is of course necessary for any development works in the L.P.T. Area which may be made the subject of an application for a revision of the percentage distribution of the London Traffic Pool.

Section 1, as far as Chessington, which is now being taken in hand, will be a double-track electrified line with 520-ft. island platforms; the layout of a typical station is shown in one of the accompanying drawings. It is proposed to provide stations at or near Old Malden, Tolworth, Moor Lane (Chessington), and Garrison Lane (Chessington). This section is estimated to cost £440,000, which sum has been authorised by the directors subject to the consent of the Standing Joint Committee to the realisation of the scheme.

Normal suburban electric sets will be used for working the line, which, as shown on our map is only 4 miles in length from its junction with the existing Wimbledon-Leatherhead line about ½ mile south of Motspur Park station to the proposed goods yard beyond the site for Garrison Lane (Chessington) passenger station.




*Key map showing site of new line*




*Plans of new line and typical station*

# Projected Services by Michelin Railcar, L.M.S.R.

After the experimental run of the Michelin pneumatic-tyred railcar over the L.M.S. main line between Euston and Leighton Buzzard last Monday (see article on page 340), a luncheon was held in the Euston Hotel at which Mr. E. J. H. Lemon, Vice-President, L.M.S.R., presided, supported by Sir John Siddeley and Mr. G. H. Loftus Allen, the railway company's Advertising and Publicity Officer.

Mr. Lemon, in discussing the scope that existed for railcars in this country, pointed out that although they had been widely adopted in France and their use extended there and in other Continental countries, conditions here were not strictly comparable. We had a very dense population and a correspondingly dense train service over our principal railway routes. Nevertheless, the British railways were determined to try out every likely experiment with a view to improving railway services and making them more attractive. It was for that reason that the L.M.S.R. was experimenting with the new Coventry railcar.

This car had two outstanding merits, one of which was that it was extremely light and therefore should be economical to operate at high speed schedules, for weight was an enemy of speed and therefore was costly. The other great merit was that, due to the use of pneumatic tyres, it was silent, and this, he believed, would be a greatly appreciated boon in these days of perpetual noise. Mr. Lemon asserted that there could be no standing still of the railways as regards speed. High speeds were in demand and must consequently be given.

The company was going to try out this railcar on a cross-country service between Oxford and Cambridge as an experiment to see whether it would attract increased traffic. It was proposed later to run it between Liverpool and Manchester. There were other inter-city services on which such cars, if they proved successful, could be operated with advantage at certain times of the day when traffic was slack and the running of normal steam hauled trains unjustifiable.

Sir John Siddeley remarked on the large number of pneumatic-tyred railcars of the Michelin type which were giving successful service in France and overseas. There were already 50 of them and more were being built. He had every confidence that the initial problems associated with the use of the pneumatic tyre on the railway had been overcome, and that the Coventry railcar would prove the success which that morning's demonstration run had promised.

# NOTES AND NEWS

**Tourist Traffic Conference.**—A Reuters message states that British and Indian travel agencies and railways are to take part in an international conference opening at Tokyo on May 2, to discuss means of promoting tourist traffic in the East.

**German Fare Reductions for British Industries Fair.**—The German State Railway is making a reduction of 25 per cent. from February 18 to March 1 on all fares for persons travelling from Germany to England to visit the British Industries Fair.

**Reopening the Worksop Branch, L.N.E.R.**—Maltby station has been reopened for passenger service at weekends to Sheffield, Doncaster, and Worksop. The branch line between Doncaster and Worksop, serving Maltby, was closed to passenger traffic five years ago.

**South African Railways' Three-Million Surplus.**—A Reuter's telegram from Cape Town, dated Thursday, states that Mr. Pirow, in introducing his railway budget today, announced a surplus of £3,048,003. After the accumulated deficit brought forward from the previous year, £2,168,269, had been wiped out, a net surplus of £879,734 remained, The anticipated surplus for the ensuing year was £44,067, and £900,000 were expected to accrue to the staff, and about the same figure to the public, directly and indirectly.

**Road Accidents.**—The Ministry of Transport return for the week ended February 16 of persons killed or injured in road accidents is as follows :—

| | Killed | | Deaths resulting from previous accidents | | Injured | |
|---|---|---|---|---|---|---|
| England | 84 | (86) | 27 | (26) | 2,892 | (2,859) |
| Wales ... | 4 | (7) | 1 | (—) | 123 | (122) |
| Scotland | 7 | (8) | 4 | (3) | 304 | (285) |
| | 95 | (101) | 32 | (29) | 3,319 | (3,266) |

The total fatalities for the week were, therefore, 127, as compared with 130 for the previous week.

**French Railway Bond Conversion.**—The Midi and Orleans Railway Companies announce issues of 4 per cent. 40-year sterling bonds to the extent of £3,068,000 in the case of the Midi and of £1,990,000 by the Orleans. Holders of the 6 per cent. sterling bonds of these companies, amounting to £2,769,800 and £1,796,500 respectively, which mature at 103 on May 16 next, are given the option, exercisable not later than March 1, of conversion rights into the new issue on the basis of £100 nominal of 4 per cent. bonds, plus £4 10s. in cash and an interest adjustment of £1 1s. 4d. for each £100 nominal of 6 per cent. bonds. The new bonds will enjoy, like the 6 per cent., the backing of the French Government. Information on the issue and conversion proposals may be obtained from Morgan, Grenfell & Co. Ltd., N. M. Rothschild & Sons, or La Zard Bros. & Co. Ltd. It is mentioned that the present concession of the Midi Company will expire on December 31, 1960, and of the Orleans on December 31, 1956.

**Linking Roumania and the U.S.S.R.**—According to press messages from Moscow, an agreement to reopen on August 1 the railway bridge over the Dniester at Tiraspol, 73 miles from Odessa, and thus re-establishing through traffic between Russia and Roumania, has been reached. The bridge has been closed since 1917.

**A 7,000-ton Forging Press.**—A new 7,000-ton electro-hydraulic forging press, claimed to be the largest of its type in the world, has been completed at the Vickers Works, Sheffield, of the English Steel Corporation Limited. The press has a penetration speed of 2 in. per sec. and will give ten 5-in. penetration strokes a minute at full load. Drive is by a high-pressure electro-hydraulic pumping set weighing about 40 tons complete.

**Southern Railway Traffic Increases.**—More than 10,900,000 passenger journeys were made to seaside and provincial towns on the Southern Railway during 1934, or an average of over 210,000 a week. This figure excludes season ticket journeys, and is an increase of 600,000 over 1933 and 1,600,000 over 1932. The new electric services to Brighton, Hove, and Worthing proved increasingly popular. Over 2,600,000 journeys were made to those resorts last year, as against 2,500,000 the year before and 1,900,000 in 1932 (the last year of steam services). Continental traffic increased by 24,000 during 1934. The Southern Railway carried 1,536,000 passengers to and from the Continent, as against 1,512,000 in 1933.

**L.N.E.R. 2-8-2 "Cock o' the North" Exhibited at the Gare du Nord.**—An exhibition representing the latest locomotive practice in Great Britain and France was inaugurated at the Gare du Nord, Paris, on February 17, by M. Le Besnerais, General Manager, Chemin de fer du Nord. The exhibits comprised the L.N.E.R. 2-8-2 locomotive *Cock o' the North*, and a Nord Super-Pacific of the most recent type, and in his opening speech, to which we refer editorially on page 327. M. Le Besnerais emphasised the free and beneficial interchange of technical ideas between this country and France which has proceeded since the days of the *Rocket*. Concluding, M. Le Besnerais invited his hearers, after inspecting the engines, to drink a glass to "the prosperity of the English railways, and a long life and a happy one to *Cock o' the North*." Mr. H. C. King-Stephens, General Agent in France for the British Railways, replied. Mr. H. N. Gresley was unable to be present, but he was represented by Mr. O. Bulleid. An illustration of *Cock o' the North* at the Gare du Nord appears on page 333. Other representatives of the Chemin de fer du Nord at the ceremony were :—

M. A. Bourgeois (Director), M. Lancrenon (Chief Mechanical Engineer), M. Cambournac (Chief Engineer), M. Girard (Secretary), M. Lenglin (Secretary, Operating Department.)

**Design in Transport.**—A double row of neatly arranged and well-lighted photographs, with descriptive matter between, is attracting a good deal of attention just now at the booking hall of Charing Cross Underground station. They show many interesting examples of present-day design in transport contrasted with that of previous years, and relate to station architecture, rolling stock, ticket machines, advertisement displays, &c. A row of some of the notable coloured posters which have done duty in the past on underground station hoardings surmounts the photographs and greatly adds to the general effectiveness of the collection.

**Canadian Appreciation of Emergency Facilities.**—A letter of appreciation signed by 150 travellers in British Columbia during the recent snow blockade has reached the Canadian National Railways headquarters in Montreal. The letter expressed their gratitude for the manner in which the railway officials and train crews looked after them when they were held up at Kamloops and prevented by the heavy snowfall from proceeding to Vancouver. The travellers entrained for Prince Rupert, the northern terminus on the Pacific, where they were transferred to the ss. *Prince George*, one of the company's British Columbia coastal passenger steamers, provided with suitable accommodation and board, and brought safely to Vancouver.

**Electrical Signal Manufacture.**—Evidence that the electrical industry of Great Britain is maintaining and extending its hold upon world markets was strikingly forthcoming on the occasion of a recent visit of representatives of the technical press to the New Southgate works of Standard Telephones & Cables Limited. This factory, despite recent very large extensions, is still building new shops, and is fully occupied. Apart from automatic and manual telephone equipment, examples of which for many home and overseas destinations were seen in the shops, the factory produces many types of electric railway-signal apparatus and has a staff working on the problem of perfecting an automatic train control system. The equipment and layout of the factory are on the most modern lines, and the organisation is adequate to the production of reliable apparatus at the lowest practicable cost, due to the employment of automatic machinery and properly planned sequences of processes. The site will permit considerable further expansion, but the present buildings are nevertheless complete, down to the provision of all the amenities

associated with a modern factory, including a canteen and splendid male and female surgeries. On the occasion mentioned visitors were shown all the departments in operation, and we understand that similar facilities are offered to any railway signal engineers who might care to see the methods of production employed in connection with equipment in which they are interested.

**Northern Ireland Traffics.**—Statistics of railway traffic and receipts in Northern Ireland for the first eleven months of 1934, which have been furnished by the Ministry of Commerce, make comparisons with 1932, in view of the abnormal position created by the strike early in 1933. On railways wholly in Northern Ireland the number of passengers (excluding season-ticket holders) in the eleven 1934 months was 5,239,931, against 5,276,880, although for the month of November the number in 1934 was 293,257 against 289,552. The tonnage of merchandise and minerals for the eleven 1934 months was only 483,317, against 614,734. Receipts from passengers (including season tickets) for the eleven 1934 months were £239,847 against £242,888. Goods traffic receipts for the eleven 1934 months were £161,939 against £214,355 in 1932. On railways partly in Northern Ireland, the number of passengers in the eleven 1934 months was 4,863,815, against 5,275,422 for the first eleven months of 1932, and the receipts from passengers were £387,112 against £421,940. Goods and livestock receipts for the eleven 1934 months amounted to £536,203 against £684,532, and the tonnage of goods and minerals was 855,273 against 1,001,190.

**Southern Railway Unclaimed Property Sale.**—The lost and unclaimed property in the possession of the Southern Railway prior to July 31 last will be sold by auction at Griffin Street, York Road, Waterloo station, S.E.1, on Monday, March 11, and two following days.

## British and Irish Traffic Returns

| GREAT BRITAIN | Totals for 7th Week | | | Totals to Date | | |
|---|---|---|---|---|---|---|
| | 1935 | 1934 | Inc. or Dec. | 1935 | 1934 | Inc. or Dec. |
| | £ | £ | £ | £ | £ | £ |
| L.M.S.R. (6,926½ mls.) | | | | | | |
| Passenger-train traffic... | 364,000 | 371,000 | – 7,000 | 2,522,000 | 2,483,000 | + 39,000 |
| Merchandise, &c. ... | 456,000 | 451,000 | + 5,000 | 3,015,000 | 3,048,000 | – 33,000 |
| Coal and coke ... | 275,000 | 274,000 | + 1,000 | 1,894,000 | 1,909,000 | – 15,000 |
| Goods-train traffic ... | 731,000 | 725,000 | + 6,000 | 4,909,000 | 4,957,000 | – 48,000 |
| Total receipts ... ... | 1,095,000 | 1,096,000 | – 1,000 | 7,431,000 | 7,440,000 | – 9,000 |
| L.N.E.R. (6,339 mls.) | | | | | | |
| Passenger-train traffic... | 243,000 | 245,000 | – 2,000 | 1,696,000 | 1,661,000 | + 35,000 |
| Merchandise, &c. ... | 306,000 | 313,000 | – 7,000 | 2,119,000 | 2,176,000 | – 57,000 |
| Coal and coke ... | 254,000 | 259,000 | – 5,000 | 1,721,000 | 1,759,000 | – 38,000 |
| Goods-train traffic ... | 560,000 | 572,000 | – 12,000 | 3,840,000 | 3,935,000 | – 95,000 |
| Total receipts ... ... | 803,000 | 817,000 | – 14,000 | 5,536,000 | 5,596,000 | – 60,000 |
| G.W.R. (3,749¼ mls.) | | | | | | |
| Passenger-train traffic... | 146,000 | 148,000 | – 2,000 | 1,085,000 | 1,058,000 | + 27,000 |
| Merchandise, &c. ... | 179,000 | 178,000 | + 1,000 | 1,229,000 | 1,205,000 | + 24,000 |
| Coal and coke ... | 108,000 | 114,000 | – 6,000 | 747,000 | 780,000 | – 33,000 |
| Goods-train traffic ... | 287,000 | 292,000 | – 5,000 | 1,976,000 | 1,985,000 | – 9,000 |
| Total receipts ... ... | 433,000 | 440,000 | – 7,000 | 3,061,000 | 3,043,000 | + 18,000 |
| S.R. (2,172 mls.) | | | | | | |
| Passenger-train traffic... | 227,000 | 225,000 | + 2,000 | 1,624,000 | 1,585,000 | + 39,000 |
| Merchandise, &c. ... | 57,500 | 62,000 | – 4,500 | 387,500 | 420,000 | – 32,500 |
| Coal and coke ... | 38,500 | 40,000 | – 1,500 | 247,500 | 265,000 | – 17,500 |
| Goods-train traffic ... | 96,000 | 102,000 | – 6,000 | 635,000 | 685,000 | – 50,000 |
| Total receipts ... ... | 323,000 | 327,000 | – 4,000 | 2,259,000 | 2,270,000 | – 11,000 |
| Liverpool Overhead ... (6½ mls.) | 1,104 | 1,114 | – 10 | 7,692 | 7,735 | – 43 |
| Mersey (4½ mls.) ... | 4,071 | 4,264 | – 193 | 29,499 | 30,252 | – 753 |
| *London Passenger Transport Board ... | 513,900 | 507,300 | + 6,600 | 17,517,900 | 17,182,400 | + 335,500 |
| IRELAND | | | | | | |
| Belfast & C.D. pass. (80 mls.) | 1,673 | 1,773 | – 100 | 12,295 | 12,452 | – 157 |
| ,, ,, goods | 462 | 523 | – 61 | 3,186 | 3,597 | – 411 |
| ,, ,, total | 2,135 | 2,296 | – 161 | 15,481 | 16,049 | – 568 |
| Great Northern pass. (543 mls.) | 7,350 | 7,400 | – 50 | 53,650 | 49,800 | + 3,850 |
| ,, ,, goods | 7,900 | 7,850 | + 50 | 55,650 | 55,400 | + 250 |
| ,, ,, total | 15,250 | 15,250 | — | 109,300 | 105,200 | + 4,100 |
| Great Southern pass. (2,124 mls.) | 17,733 | 18,786 | – 1,053 | 129,105 | 129,361 | – 256 |
| ,, ,, goods | 31,159 | 32,627 | – 1,468 | 269,358 | 221,884 | + 47,474 |
| ,, ,, total | 48,892 | 51,413 | – 2,521 | 398,463 | 351,245 | + 47,218 |

* 33rd week, the receipts for which include those undertakings not absorbed by the L.P.T.B. in the corresponding period last year; last year's figures are, however, adjusted for comparative purposes.

## British and Irish Railways Stocks and Shares

| Stocks | Highest 1934 | Lowest 1934 | Prices Feb. 20, 1935 | Prices Rise/Fall |
|---|---|---|---|---|
| G.W.R. | | | | |
| Cons. Ord. ... | 66½ | 48½ | 49½* | –2½ |
| 5% Con. Prefce. ... | 118 | 109 | 117* | –1½ |
| 5% Red. Pref. (1950) | 115 | 107 | 112½* | –4 |
| 4% Deb. ... ... | 117 | 105 | 113½ | — |
| 4½% Deb.... ... | 119 | 109 | 118½ | — |
| 4½% Deb.... ... | 129½ | 115¼ | 126½ | — |
| 5% Deb. ... ... | 135 | 126¼ | 138½ | — |
| 2½% Deb.... ... | 75 | 64 | 81½ | — |
| 5% Rt. Charge ... | 134⁷⁄₁₆ | 123¼ | 133½ | –1 |
| 5% Cons. Guar. ... | 132¾ | 121¾ | 131½* | –2 |
| L.M.S.R. | | | | |
| Ord. ... ... | 30½ | 19½ | 18 | –½ |
| 4% Prefce. (1923) | 64¼ | 41 | 48* | –½ |
| 4% Prefce. ... | 87 | 69½ | 80* | –2½ |
| 5% Red. Pref. (1955) | 107 | 92½ | 103½ | –1 |
| 4% Deb. ... ... | 114⅛ | 100½ | 104½ | –1 |
| 5% Red. Deb. (1952) | 118¹¹⁄₁₆ | 111¼ | 118½ | -- |
| 4% Guar.... ... | 106½ | 96¾ | 100* | –2½ |
| L.N.E.R. | | | | |
| 5% Pref. Ord. ... | 24¾ | 13½ | 12 | –½ |
| Def. Ord. ... ... | 11½ | 6⅞ | 6¼ | –¼ |
| 4% First Prefce. ... | 76 | 59½ | 66½ | — |
| 4% Second Prefce. | 47 | 25½ | 25 | — |
| 5% Red. Pref. (1955) | 94½ | 80 | 87½ | — |
| 4% First Guar. ... | 104 | 92 | 98½ | — |
| 4% Second Guar. | 97⅞ | 86½ | 92½ | –1 |
| 3% Deb. ... ... | 90 | 74½ | 80½ | — |
| 4% Deb. ... ... | 114 | 99¼ | 103½ | –1 |
| 5% Red. Deb. (1947) | 117 | 108 | 115½ | –1½ |
| 4½% Sinking Fund Red. Deb. | 111¼ | 105¼ | 110½ | — |
| SOUTHERN | | | | |
| Pref. Ord.... ... | 90 | 63⅛ | 80* | –3 |
| Def. Ord. ... ... | 32⅝ | 19 | 21 | –½ |
| 5% Prefce. ... | 118³⁄₁₆ | 107½ | 117½* | –2 |
| 5% Red. Pref. (1964) | 115¾ | 107½ | 114½* | –2 |
| 5% Guar. Prefce. | 132 | 120¾ | 131½* | –2 |
| 5% Red. Guar. Pref. (1957) | 119½ | 113 | 118* | –2 |
| 4% Deb. ... ... | 116½ | 103¼ | 112½ | — |
| 5% Deb. ... ... | 134 | 124¹³⁄₁₆ | 136½ | — |
| 4% Red. Deb. 1962–67 | 113¹¹⁄₁₆ | 105⁹⁄₁₆ | 112½ | –1½ |
| BELFAST & C.D. | | | | |
| Ord. ... ... | 6 | 5 | 5¼ | — |
| FORTH BRIDGE | | | | |
| 4% Deb. ... ... | 110 | 100 | 109½ | — |
| 4% Guar. ... ... | 110 | 100 | 109½ | — |
| G. NORTHERN (IRELAND) | | | | |
| Ord. ... ... | 9¾ | 4¹⁵⁄₁₆ | 10 | — |
| G. SOUTHERN (IRELAND) | | | | |
| Ord. ... ... | 25 | 12½ | 24½ | — |
| Prefce. ... ... | 21½ | 13¹⁵⁄₁₆ | 29 | +1½ |
| Guar. ... ... | 48 | 39 | 60 | –2 |
| Deb. ... ... | 67 | 59 | 75 | –1½ |
| L.P.T.B. | | | | |
| 4½% "A" ... | 126 | 115 | 123½ | –2 |
| 5% "A" ... ... | 135½ | 124½ | 134½ | –1 |
| 4½% "T.F.A." ... | 113½ | 107½ | 112½ | –½ |
| 5% "B" ... ... | 131¾ | 118 | 125½ | –1 |
| "C" ... ... | 97 | 73 | 93* | –1 |
| MERSEY | | | | |
| Ord. ... ... | 15¼ | 7 | 14 | — |
| 4% Perp. Deb. ... | 93½ | 82½ | 94½ | — |
| 3% Perp. Deb. ... | 66½ | 61½ | 69½ | — |
| 3% Perp. Prefce.... | 54 | 44½ | 52½ | — |

* ex dividend

# CONTRACTS AND TENDERS

Ransomes & Rapier Limited has received an order from the Southern Railway for one 65-ft. standard type engine turntable designed for a working load of 162½ tons, for installation at Norwood Junction.

The Gloucester Railway Carriage & Wagon Co. Ltd. has received an order from the Sudan Railways for two 3-ft. 6-in. gauge bogie carriage underframes each 57 ft. 6 in. over headstocks and complete with bogies, wheels and axles and Vacuum brake gear. These underframes are required for post and baggage vans.

The Hunslet Engine Co. Ltd. has received an order from the Bengal-Nagpur Railway for one saturated steam boiler for a 2 ft. 6 in.-gauge locomotive.

### Colour-Light Signalling, L.N.E.R.

The Siemens & General Electric Railway Signal Co. Ltd. has received a contract from the L.N.E.R. for the supply and installation of power signalling equipment at Belle Isle, near King's Cross. This will constitute, in effect, an extension to the King's Cross power signalling installation, which was carried out by this company and brought into service in the early part of 1933 and which has proved highly satisfactory in operation under strenuous conditions. The equipment will be identical with that already in use at King's Cross, as described in the issue of THE RAILWAY GAZETTE of May 26, 1933, pp. 703-708.

The Motherwell Bridge & Engineering Co. Ltd. has received an order from the L.M.S.R. for 600 pressed steel wagon end plates for supply to Derby shops.

Federated Engineers Limited has received an order from the South African Railways & Harbours Administration for a quantity of steel keys.

The Sinterae Illuminating Company has received an order from the L.M.S.R. for a Sinterae fog beacon to be erected at Tilbury. This beacon is the first of its kind to be used for the purpose of navigation.

The Locomotive Firebox Company has received an order from the Chilean State Railways for sets of thermic syphons to be applied to ten of the locomotives on order from German firms as recorded in this column in our January 11 issue.

Henry Robb Limited has received an order from the Forestal Land, Timber & Railways Co. Ltd. for a vessel specially designed to carry large cargoes on rivers of shallow draught. The new vessel, which is similar to one built by the same firm for this company four years ago, will be propelled by two five-cylinder 725-h.p. Polar diesel engines, and will carry a cargo of 1,500 tons with a draught of only 8 ft. 6 in. The auxiliary machinery will be electrically operated. State rooms for passengers will be arranged amidships.

Dorman Long & Co. Ltd. has secured a contract for the fabrication and erection of the combined rail and road bridge over the Tsientang or Chien Tang River at Zahow, near Hangchow, referred to in the Overseas columns of the issues of THE RAILWAY GAZETTE of July 6 and September 21 last. The bridge, which will require about 4,200 tons of steel, will consist of 16 spans, each of 216 ft. length, and is designed to carry a single track railway on the lower deck, and a 20 ft. road and two pedestrian ways on the upper deck. This bridge will replace a ferry and link up the line from Ningpo with the Shanghai-Hangchow section of the Shanghai-Hangchow-Ningpo Railway and also with the Hangchow-Kiangshan provincial railwa which, as explained in our issue of October 12 last, will be part of the Canton-Shanghai through route, now under construction.

### Sale of Egyptian Locomotives and Rolling Stock

Arising out of the widening of the Egyptian State Railways' Luxor-Aswan line from 3 ft. 6 in. to 4 ft. 8½ in. gauge during 1925-26, the 24 locomotives, 38 coaches, 138 wagons and 18 underframes, all 3 ft. 6 in. gauge, have now been offered for sale in Cairo.

The Egyptian State Railways Administration has placed the following orders :—

P. & W. MacLellan Limited: Steel joists (Ref. E.S.R. 1.178, total cost £319 16s. 3d.).
H. J. Skelton & Co. Ltd.: Mild steel beams (Ref. E.S.R. 1.175, total cost £746 18s.).
Guest Keen & Nettlefolds Limited: Steel metal screws (Ref. E.S.R. 3.123, items 1-58, total cost £248 12s.).
Visseries & Trefileries Réunies: Steel metal screws (Ref. E.S.R. 3.123, items 59-208, total cost £84 2s. 11d.).
The Atlas Carbon & Battery Co. Ltd.: Porous Léclanché pots (Ref. E.S.R. 34.331, total cost £410).
J. B. Corrie & Co. Ltd., on behalf of Union des Aciéries: Cast steel piston heads (Ref. E.S.R. 21.258, total cost £158 2s.).
Siemens Bros. & Co. Ltd.: Automatic telephone sets (Ref. E.S.R. 34.307, items 1, 2 and half items 3 and 4, total cost £5,455 15s.).
Ericsson Telephones Limited: Automatic telephone sets (Ref. E.S.R. 34.307, item 5 and half items 3 and 4, total cost £1,587 5s.).
Ateliers de Constructions Electriques de Charleroi, W. F. Dennis & Co., British Insulated Cables Limited, N.V. Nederlandsche Kabelfabriek, and Vereinigte Deutsche Metallwerk: Wire (Ref. E.S.R. 30.124).

Leyland Motors Limited has received orders from railway-associated road operators as follow: Scottish Motor Traction Co. Ltd., 101 oil engines for conversion of single decked vehicles in S.M.T. Western group; and City of Oxford Motor Services Limited, two Cub passenger vehicles.

Vickers Train Lighting Co. Ltd. is to supply the Vickers V1 single battery electric train-lighting equipment for the 96 new coaches to be made up into twelve eight-car train sets for Great Eastern section suburban service, L.N.E.R. The orders for these coaches and the builders concerned were detailed in this column in our issue for February 8.

The Crown Agents for the Colonies have recently placed orders for equipment as follow :—

Air Pumps Limited: Air compressors.
Babcock & Wilcox Limited: Boiler.
Pulsometer Engineering Co. Ltd.: Centrifugal pumps.
Stanton Ironworks Co. Ltd.: Cast-iron pipes.
T. Broadbent & Sons Limited: Electric capstans.
Wolverhampton Corrugated Iron Co. Ltd.: Galvanised corrugated steel sheets.
Stothert & Pitt Limited: Graving dock crane.
British (Guest, Keen, Baldwins) Iron & Steel Co. Ltd.: Rails and fishplates.
P. & W. MacLellan Limited: Round mild steel and steel beams.
Cowans Sheldon & Co. Ltd.: Spring fenders.
Talbot Stead Tube Co. Ltd.: Steel boiler tubes.
Wm. Bain & Co. Ltd.: Steelwork.
Cleveland Bridge & Engineering Co. Ltd.: Bridge work.
Westinghouse Brake & Signal Co. Ltd.: Westinghouse brake material.
J .Stone & Co. Ltd.: Whitemetal and spelter.

The Chief Controller of Stores, Indian Stores Department, has placed the following orders at the prices named :—

Wright Pinhorn & Partners Limited: 310 steel locomotive tyres (Rs. 30,679); 436 3 ft. 7 in. diam. carriage and wagon tyres (Rs. 35,207); and 96 locomotive tyres for 5 ft. 6-in. gauge (Rs. 12,692).
Shaw Wallace & Company: 211 locomotive straight axles (Rs. 48,697); and 546 straight axles for broad gauge carriages and wagons (Rs. 78,965).
Skoda (India) Limited: 114 T Y/56 tyres 4 ft. 0¼ in. diam. (Rs. 13,808) and 1,200 broad gauge 3 ft. 7 in. diam. tyres (Rs. 96,000).
William Jacks & Co.: Six crank axles (Rs. 10,990).
Krupp Indian Trading Co. Ltd.: 1,150 broad-gauge carriage and wagon steel tyres (Rs. 92,287).
Alfred Herbert Limited: Two sets of crude oil-engine driven air compressors (Rs. 28,280).
The S.K.F. Ball Bearing Co. Ltd. and Roberts McLean & Co. Ltd.: Ball and roller bearings, rate contract.

### Boilers wanted for India

Tenders are invited by the North Western Railway of India, Lahore, receivable by April 8, for 15 superheated S. P/S (4-4-0) locomotive boilers.

The Chief Controller of Stores, Indian Stores Department (Engineering Section), New Delhi, invites tenders receivable on the dates named as follow :—

For two portable d.c. motor-driven single-operator arc welding sets, required for the N.W.R. Jhelum workshops (March 4).
For carriage body fittings for E.B.R. coaching stock (March 5).
For 60,000 buffer springs for E.I.R. (March 5).
For 60,000 m.s. bearing plates for 90 R.F.F. B.S.S. 90-lb. rails for N.W.R. (March 13).
For 400 glut rings and 300 broad gauge 3 ft. 7 in. carriage and wagon wheels for the N.W.R. (March 13).
For one cold starting crude oil-engine driven air cum centrifugal pumping plant of 12,500 g.p.h. against a head of 48-ft capacity (March 18).

The Swedish State Railways Administration is inviting tenders, closing on March 2, for 123,500 tons of coal.

The Argentine State Oilfields Administration is calling for tenders receivable in Buenos Aires by March 22 for a diesel locomotive for 60 cm. gauge Decauville track. Further details can be obtained from the Department of Overseas Trade, quoting reference No. GY 14834.

The Ministry of Finance, Survey of Egypt, is calling for tenders, to be presented in Giza by March 23, for the supply of 4,000 tons of light and heavy section new or secondhand rails—15 and 30 kilos per metre run. Further details can be obtained from the Department of Overseas Trade.

# OFFICIAL NOTICES

### London & North Eastern Railway Company.

NOTICE IS HEREBY GIVEN that the Twelfth Ordinary General Meeting of the Proprietors of the London & North Eastern Railway Company will be held in the Wharncliffe Rooms, Hotel Great Central, Marylebone, London, N.W.1, on Friday, the 8th day of March, 1935, at 2 p.m., for the purpose of the general business of the Company.

NOTICE IS ALSO HEREBY GIVEN that it is the intention of Mr. A. J. Barber-Fleming, one of the Proprietors of the Company, to move the following Resolution at this Meeting :—

"That any Stockholder qualified as a Proprietor to attend and vote at the Annual General Meeting of the Company shall be entitled, on the occasion of the Meeting, to a Return Ticket at the same cheap fares as are granted to members of the public attending public gatherings, conferences and the like and that the General Manager be requested to arrange for the necessary interchange of facilities with the other British Railway Companies."

NOTICE IS HEREBY FURTHER GIVEN that in accordance with the Standing Orders of Parliament, a Special or Extraordinary General Meeting of the Proprietors of the Company will be held at the same place on the same day at 3 p.m. or as soon thereafter as the business of the Ordinary General Meeting is concluded, for the purpose of considering and, if thought fit, of approving the following Bill which has been introduced into Parliament intituled :—

"A Bill to make provision as to the tolls and charges leviable by the London & North Eastern Railway Company on their canals; to extinguish the navigation rights on the Grantham Canal of the said Company; to extend the time for the completion of certain works; and for other purposes";

and the following Bill promoted by the London Passenger Transport Board which has been introduced into Parliament intituled :—

"A Bill to empower the London Passenger Transport Board to provide certain services of trolley vehicles; to construct new works; to acquire lands; to raise additional moneys; to extend the time for the exercise of certain powers of the Board in relation to trolley vehicles; to confer further powers on the Board; and for other purposes."

Dated this 20th day of February, 1935.

By Order,
JAMES McLAREN,
Secretary.

Marylebone Station,
London, N.W.1.

### The Bengal & North Western Railway Co., Ltd.

THE Directors are prepared to receive Tenders for the supply of :—

1,329 STEEL TYRES FOR LOCOMOTIVES, CARRIAGES AND WAGONS,

as per Specification to be seen at the Company's Offices.

Tenders addressed to the undersigned, and envelope marked "Tender for Steel Tyres," with name of firm tendering, to be lodged not later than noon on the 12th day of March, 1935.

For each Specification a fee of 10s. will be charged which cannot, under any circumstances, be returned.

The Directors do not bind themselves to accept the lowest or any Tender.

By Order of the Board,
W. R. IZAT.
Managing Director.

237, Gresham House,
Old Broad Street,
London, E.C.2.
February 19, 1935.

### South Indian Railway Company Limited.

THE Directors are prepared to receive Tenders for the supply of :—

SOLID DRAWN STEEL BOILER TUBES.

Specifications and Forms of Tender will be available at the Company's Offices, 91, Petty France, Westminster, S.W.1.

Tenders, addressed to the Chairman and Directors of the South Indian Railway Co. Ltd., marked "Tender for Steel Boiler Tubes," with the name of the firm tendering, must be left with the undersigned not later than 12 noon on Friday, the 8th March, 1935.

The Directors do not bind themselves to accept the lowest or any Tender.

A charge, which will not be returned, will be made of 10s. for each copy of the Specification.

A. MUIRHEAD,
Managing Director.

91, Petty France,
Westminster, S.W.1.
20th February, 1935.

PATENTS for Inventions, Trade Marks, Advice, Handbook, and consultations free. King's Patent Agency, Ltd. (B. T. King, C.I.M.E., Registered Patent Agent, G.B., U.S., and Canada), 146A, Queen Victoria Street, London, E.C.4. 49 years' references. 'Phone City 6161.

### London Midland and Scottish Railway Company

NOTICE is hereby given that a Special General Meeting of the London Midland & Scottish Railway Company will, in compliance with the Standing Orders of Parliament, be held at Euston Station, London, N.W.1, on Tuesday, the 5th day of March, 1935, at twelve o'clock noon precisely for the purpose of considering and if so determined of approving the undermentioned Bill and Provisional Order, namely :—

BILL PROMOTED BY THE COMPANY. DEPOSITED IN PARLIAMENT.

London Midland & Scottish Railway Bill.

A Bill to empower the London Midland & Scottish Railway Company to acquire Lands; to revise the rules of the Superannuation Fund of the Company; to make provision in relation to tolls and charges upon the Canals of that Company and of the West London Extension Railway Company; and for other purposes.

PROVISIONAL ORDER PROMOTED BY THE COMPANY. DEPOSITED WITH THE SCOTTISH OFFICE.

London Midland & Scottish Railway Provisional Order.

A Provisional Order to extend the time for the completion of certain authorised Railways and Works and for the purchase of Lands by the London Midland & Scottish Railway Company; and as to canal charges; and for other purposes.

JOSIAH CHARLES STAMP,
Chairman.
OWEN GLYNNE ROBERTS,
Secretary.

Euston Station,
London, N.W.1.
18th February, 1935.

THE MADRAS & SOUTHERN MAHRATTA RAILWAY CO. LTD. invite Tenders for :—

314 PAIRS OF WHEELS AND AXLES FOR WAGONS (BROAD GAUGE).

Specification and Form of Tender can be obtained at the Company's Offices, 25, Buckingham Palace Road, Westminster, London, S.W.1.

Fee ONE GUINEA, *which will not be returned.*

Tenders must be submitted not later than 2 o'clock p.m. on Tuesday, 12th March, 1935.

The Directors do not bind themselves to accept the lowest or any Tender and reserve to themselves the right of reducing or dividing the order.

By Order of the Board,
G. W. V. DE RHE PHILIPE,
Secretary.

# RAILWAY AND OTHER REPORTS

**Beira Railway.**—Gross receipts of the Beira-Umtali section for the year ended September 30, 1934, amounted to £651,264, an increase of £148,747 on the previous year, and in the working expenses of £319,171 there was an advance of only £20,951. Net receipts were, therefore, £332,093, an increase of £127,796. After providing for interest and sinking fund on the prior lien rent charge and on the 6½ per cent. debenture stock and for other expenses, there is a profit on the year's working of £91,758, against a loss of £37,693. Adding £1,338 brought forward gives an available total of £93,096. It is proposed to place £45,000 to reserve and £10,000 to a contingency reserve, and to carry forward £38,096. Both the tonnage of and revenue from general merchandise show a satisfactory improvement, due largely to the further expansion of the copper mines in Northern Rhodesia and to the activity in the gold-mining areas of Southern Rhodesia.

**London Passenger Transport Board.**—An interim payment of 1½ per cent., less income tax at 4s. 6d. in the £ on account of interest on London Transport C stock for the year ending June 30, 1935, will be made by the board's registrars, the Bank of England, on March 25, 1935, to all holders of London Transport C stock registered or inscribed in the books of the Bank of England at the close of business on February 22, 1935. The proceedings before the Arbitration Tribunal for determining the consideration payable to the independent undertakings are continuing, and the pooling scheme with the main line railway companies, the form of which is now agreed, awaits confirmation by that tribunal, and until these matters are finally settled the amount of revenue available for payment of interest on the C stock cannot be determined.

**Forth Bridge Railway.**—For the year 1934 the balance credited to the London & North Eastern Railway Company, which works the Forth Bridge Railway, was £2,730, as compared with £2,754 for 1933, and £2,318 for 1932. Traffic receipts from the L.N.E.R. were £177,000, compared with £178,000 for 1933 and £175,500 for 1932, and the net receipts, after deducting expenditure on maintenance of works, general charges, rates, railway freight rebates, &c., amounted to £131,200 in 1934, compared with £132,752 in 1933, and £132,395 in 1932. Net revenue amounted to £124,663, against £124,687 in 1933 and £124,251 in 1932. After providing for interest on 4 per cent. debenture stock (£28,933) and for a dividend of 4 per cent. (£93,000) on the ordinary stock, there remains a balance of £2,730 as above stated.

XUM

# Railway Share Market

In the stock and share markets the home railway section has had to contend with varying influences. The increase in the unemployment figures last week and the disappointing traffic receipts were the adverse influences. The favourable factors were the issue of the accounts of the railways and the encouraging nature of the trade returns. On balance, it would not be untrue to say that the market has moved distinctly in favour of the holder of home railway stocks, even if quotations do not reflect the improvement by a series of upward changes.

Allowance has to be made for the deduction of the dividends which took place on Monday, the first day of the new Stock Exchange account. Many investors seized the opportunity to acquire stock at the lower and "ex" dividend prices, which resulted in Great Western ordinary stock rising on balance and the London Midland & Scottish 1923 preference stock regaining the whole of the amount deducted for the dividend. L.M.S. 1923 preference stock and the Southern preferred ordinary stock are regarded as two interesting stocks for capital appreciation in the current year, coupled with some income return. In the case of the Southern deferred, which has been a rising market, purchasers are taking a longer view and probably do not look for much in the way of dividend for another year or so. London & North Eastern issues were on the quiet side pending announcement of the results late this week. It was not without interest, however, that the company's second preference stock, in which there is a well-spread interest among the public, was the only stock in the home railway market to record an advance on Tuesday in the jobbers' books, although it is true that a few other stocks were altered in the *Official List*. The latter does not always provide the same real measure of the market as is to be found in the actual price which jobbers in stocks may be prepared to make to brokers who are out to do business for a client. Transport "C" stock remained around 93 "ex" dividend.

Foreign railway stocks moved in a disappointing way. Argentine railway stocks in the early part exhibited greater activity following expressions of confidence in the Argentine outlook by many directors, but prices subsequently slipped back. Central Argentine 4 per cent. debenture stock established an advance. The activity in American railroad common shares following the "Gold Clause" decision proved short-lived.

## Traffic Table of Overseas and Foreign Railways Publishing Weekly Returns

| | Railways | Miles open 1934-35 | Week Ending | Traffics for Week: Total this year | Traffics for Week: Inc. or Dec. compared with 1934 | No. of Week | Aggregate Traffics to Date: Totals: This Year | Aggregate Traffics to Date: Totals: Last Year | Aggregate Traffics to Date: Increase or Decrease | Shares or Stock | Prices: Highest 1934 | Prices: Lowest 1934 | Prices: Feb. 20, 1935 | Yield % (See Note) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | £ | £ | | £ | £ | £ | | | | | |
| South & Central America. | Antofagasta (Chili) & Bolivia | 830 | 17.2.35 | 13,850 | + 3,600 | 7 | 82,600 | 80,250 | + 2,350 | Ord. Stk. | 26¾ | 19 | 20 | Nil |
| | Argentine North Eastern | 753 | 16.2.35 | 7,035 | + 747 | 33 | 239,957 | 282,221 | − 42,264 | ,, | 11 | 6⅞ | 7 | Nil |
| | Argentine Transandine | 111 | — | — | — | — | — | — | — | A. Deb. | 52 | 45 | 50 | 8 |
| | Bolivar | 174 | Jan., 1935 | 5,850 | − 700 | 4 | 5,850 | 6,550 | − 700 | 6 p.c. Db. | 10 | 6½ | 10 | Nil |
| | Brazil | — | — | — | — | — | — | — | — | Bonds. | 13¾ | 10 7/16 | 13 | 31 5/16 |
| | Buenos Ayres & Pacific | 2,806 | 16.2.35 | 94,507 | + 4,646 | 33 | 2,344,632 | 2,737,142 | − 392,540 | Ord. Stk. | 16½ | 8½ | 8 | Nil |
| | Buenos Ayres Central | 190 | 3.2.35 | $87,700 | − $11,100 | 31 | $3,547,100 | $3,538,500 | + $8,600 | Mt. Db. | 23 | 10 | 21½ | Nil |
| | Buenos Ayres Gt. Southern | 5,085 | 16.2.35 | 207,265 | + 39,975 | 33 | 4,485,348 | 5,292,554 | − 807,206 | Ord. Stk. | 35 | 22 | 26 | Nil |
| | Buenos Ayres Western | 1,930 | 16.2.35 | 53,160 | + 8,199 | 33 | 1,415,375 | 1,728,727 | − 313,352 | ,, | 27½ | 18½ | 22 | Nil |
| | Central Argentine | 3,700 | 16.2.35 | 132,558 | + 28,216 | 33 | 3,886,480 | 4,499,022 | − 612,542 | ,, | 23 | 13½ | 16½ | Nil |
| | Do. | — | — | — | — | — | — | — | — | Dfd. | 14 | 7 | 8½ | Nil |
| | Cent. Uruguay of M. Video | 273 | 16.2.35 | 20,777 | + 5,783 | 33 | 553,828 | 537,219 | + 16,609 | Ord. Stk. | 15⅛ | 8 | 8½ | Nil |
| | Do. Eastern Extn. | 311 | 16.2.35 | 5,010 | + 1,909 | 33 | 117,491 | 105,485 | + 12,006 | — | — | — | — | — |
| | Do. Northern Extn. | 185 | 16.2.35 | 2,796 | + 803 | 33 | 63,120 | 57,554 | + 5,566 | — | — | — | — | — |
| | Do. Western Extn. | 211 | 16.2.35 | 1,826 | + 23 | 33 | 50,694 | 53,035 | − 2,341 | — | — | — | — | — |
| | Cordoba Central | 1,218 | 16.2.35 | 24,340 | + 4,300 | 33 | 964,000 | 1,183,220 | − 219,220 | Ord. Inc. | 6 | 3 | 3½ | Nil |
| | Costa Rica | 188 | Dec., 1934 | 18,046 | + 2,804 | 26 | 99,051 | 114,966 | − 15,915 | Stk. | 30¾ | 23½ | 31½ | 6⅜ |
| | Dorada | 70 | Jan., 1935 | 10,500 | − 1,200 | 4 | 10,500 | 11,700 | − 1,200 | 1 Mt. Db. | 103 | 95 | 102½ | 5⅞ |
| | Entre Rios | 810 | 16.2.35 | 13,195 | + 2,754 | 33 | 417,297 | 436,296 | − 18,999 | Ord. Stk. | 21½ | 12 | 14 | Nil |
| | Great Western of Brazil | 1,082 | 16.2.35 | 11,100 | + 1,200 | 7 | 78,500 | 78,700 | − 200 | Ord. Sh. | ⅞ | 5/8 | 1/2 | Nil |
| | International of Cl. Amer. | 794 | Dec., 1934 | $410,865 | − $1,049 | 52 | $4,722,779 | $4,537,682 | + $185,097 | — | — | — | — | — |
| | Interoceanic of Mexico | — | — | — | — | — | — | — | — | 1st Pref. | 1/- | 1/- | 1/2 | Nil |
| | La Guaira & Caracas | 22¾ | Jan., 1935 | 3,100 | − 1,300 | 4 | 3,100 | 4,400 | − 1,300 | Stk. | 12¾ | 7⅝ | 8½ | Nil |
| | Leopoldina | 1,918 | 16.2.35 | 20,373 | − 422 | 7 | 159,156 | 147,345 | + 11,811 | Ord. Stk. | 14⅝ | 7 | 7½ | Nil |
| | Mexican | 483 | 14.2.35 | $297,100 | + $67,600 | 6 | $1,515,400 | $1,307,000 | + $208,400 | ,, | 3¼ | 1½ | 1½ | Nil |
| | Midland of Uruguay | 319 | Jan., 1935 | 13,282 | + 1,832 | 30 | 79,115 | 68,680 | + 10,435 | ,, | 1½ | ½ | 1½ | Nil |
| | Nitrate | 401 | 15.2.35 | 9,213 | + 739 | 6 | 19,173 | 42,123 | − 22,950 | Ord. Sh. | 32/32 | 5/16 | 2½ | Nil |
| | Paraguay Central | 274 | 16.2.35 | 7,120 | + 4,410 | 33 | 157,850 | 106,150 | + 51,700 | Pr. Li. Stk. | 84 | 67 | 76½ | 7 5/16 |
| | Peruvian Corporation | 1,059 | Jan., 1935 | 65,309 | + 6,580 | 30 | 436,825 | 388,420 | + 48,405 | Pref. | 14½ | 8 | 8 | Nil |
| | Salvador | 100 | 9.2.35 | ¢41,500 | + ¢9,600 | 32 | ¢542,752 | ¢543,333 | − ¢581 | Pr. Li. Db. | 75 | 70 | 70 | 7⅛ |
| | San Paulo | 153½ | 10.2.35 | 29,364 | − 3,380 | 6 | 183,615 | 176,927 | + 6,688 | Ord. Stk. | 86 | 67 | 66 | 6 1/16 |
| | Taltal | 164 | Jan., 1935 | 3,100 | + 23 | 30 | 16,670 | 15,592 | + 1,087 | Ord. Sh. | 2⅛ | 1 1/16 | 1¾ | 5 11/16 |
| | United of Havana | 1,365 | 16.2.35 | 50,877 | + 25,486 | 33 | 618,875 | 456,056 | + 162,819 | Ord. Stk. | 6 | 2 | 3 | Nil |
| | Uruguay Northern | 73 | Jan., 1935 | 1,152 | + 230 | 30 | 8,446 | 8,305 | + 141 | Deb. Stk. | 6¼ | 3 | 5½ | Nil |
| Canada. | Canadian National | 23,735 | 7.2.35 | 600,058 | + 67,857 | 5 | 3,022,115 | 2,844,717 | + 177,398 | — | — | — | — | — |
| | Canadian Northern | — | — | — | — | — | — | — | —4p.c. | Perp. Dbs. | 78¼ | 51½ | 69½ | 5¾ |
| | Grand Trunk | — | — | — | — | — | — | — | — | 4 p.c. Gar. | 104½ | 97¼ | 100½ | 4 |
| | Canadian Pacific | 17,211 | 14.2.35 | 449,600 | + 30,600 | 6 | 2,539,200 | 2,644,000 | − 104,800 | Ord. Stk. | 18 5/16 | 11 1/16 | 13 | Nil |
| India.† | Assam Bengal | 1,329 | 19.1.35 | 29,107 | + 7,336 | 42 | 1,131,928 | 985,774 | + 146,154 | Ord. Stk. | 88½ | 72 | 87½ | 3 7/16 |
| | Barsi Light | 202 | 26.1.35 | 2,460 | − 765 | 43 | 116,145 | 124,102 | − 7,957 | Ord. Sh. | 104½ | 98¾ | 104½ | 5⅝ |
| | Bengal & North Western | 2,113 | 26.1.35 | 57,195* | + 21,731 | 17 | 811,081 | 783,295 | + 27,786 | Ord. Stk. | 297½ | 262 | 294½ | 5 7/16 |
| | Bengal Dooars & Extension | 161 | 26.1.35 | 2,871 | + 283 | 43 | 129,813 | 128,671 | + 1,142 | ,, | 125¼ | 124 | 126½ | 5½ |
| | Bengal-Nagpur | 3,269 | 19.1.35 | 114,000 | + 5,980 | 42 | 4,650,572 | 4,334,344 | + 316,228 | ,, | 105½ | 96 | 104½ | 3 5/16 |
| | Bombay, Baroda & Cl. India | 3,072 | 9.2.35 | 198,300 | − 1,950 | 45 | 7,042,350 | 6,704,700 | + 337,650 | ,, | 115 | 108½ | 114½ | 5¼ |
| | Madras & South'n Mahratta | 3,230 | 19.1.35 | 92,625 | − 5,793 | 42 | 4,433,388 | 4,500,215 | − 66,827 | ,, | 131 | 122¾ | 127½ | 7 7/16 |
| | Rohilkund & Kumaon | 572 | 26.1.35 | 11,574 | − 313 | 17 | 160,895 | 151,553 | + 9,342 | ,, | 263 | 250 | 274½ | 5 5/16 |
| | South India | 2,526 | 19.1.35 | 71,426 | + 5,349 | 42 | 3,315,957 | 3,250,569 | + 65,388 | ,, | 119 | 115 | 116 | 6⅞ |
| Various. | Beira-Umtali | 204 | Dec., 1934 | 55,495 | + 6,077 | 13 | 180,985 | 149,024 | + 31,961 | — | — | — | — | — |
| | Bilbao River & Cantabrian | 15 | Jan., 1935 | 2,249 | + 702 | 4 | 2,249 | 1,547 | + 702 | — | — | — | — | — |
| | Egyptian Delta | 621 | 31.1.35 | 8,081 | − 146 | 44 | 203,124 | 199,295 | + 3,829 | Prf. Sh. | 21 5/16 | 15¾ | 23⅜ | 4¼ |
| | Great Southern of Spain | 104 | 9.2.35 | 1,977 | + 50 | 6 | 12,774 | 13,249 | − 475 | Inc. Deb. | 4 | 3½ | 3½ | Nil |
| | Kenya & Uganda | 1,625 | Jan., 1935 | 239,686 | + 47,245 | 4 | 239,686 | 192,441 | + 47,245 | — | — | — | — | — |
| | Manila | — | — | — | — | — | — | — | — | B. Deb. | 50 | 33 | 47 | 7 7/16 |
| | Mashonaland | 913 | Dec., 1934 | 109,744 | + 19,028 | 13 | 342,255 | 277,053 | + 65,202 | 1 Mg. Db. | 101 | 91¾ | 103 | 4⅞ |
| | Midland of W. Australia | 277 | Dec., 1934 | 14,518 | − 767 | 26 | 85,947 | 80,396 | + 5,551 | Inc. Deb. | 100 | 93 | 96½ | 5 5/16 |
| | Nigerian | 1,905 | 29.12.34 | 47,470 | − 12,035 | 39 | 1,402,815 | 1,205,229 | + 197,586 | — | — | — | — | — |
| | Rhodesia | 1,538 | Dec., 1934 | 181,616 | + 32,520 | 13 | 556,652 | 465,394 | + 91,258 | 4 p.c. Db. | 104⅞ | 97½ | 105 | 3 15/16 |
| | South African | 13,217 | 26.1.35 | 552,918 | + 62,263 | 43 | 22,164,454 | 19,513,746 | +2,650,708 | — | — | — | — | — |
| | Victorian | 6,172 | Oct., 1934 | 893,146 | + 75,686 | 17 | 3,032,823 | 2,938,131 | + 94,692 | — | — | — | — | — |
| | Zafra & Huelva | 112 | Dec., 1934 | 10,586 | − 141 | 52 | 138,474 | 134,554 | + 3,920 | — | — | — | — | — |

NOTE.—Yields are based on the approximate current prices and are within a fraction of 1/16.

*Earthquake 1934. † Receipts are calculated @ 1s. 6d. to the rupee. § ex dividend. Salvador receipts are in currency.

The variation in Sterling value of the Argentine paper peso has lately been so great that the method of converting the sterling weekly receipts at the par rate of exchange has proved misleading, the amount being overestimated. The statements from July 1 onwards are based on the current rate of exchange and not on the par value.

# Diesel Railway Traction

## The Diesel in Argentina

ASTOUNDING progress has been made in the intended application of diesel traction to Argentine railways within the past few months. The Buenos Ayres Great Southern Railway has been known for its pioneer work since 1929, but falling revenue and exchange difficulties have caused the boards of other railways to take full advantage of the recent developments in diesel railway traction. At the present time, Argentina organisations possess 19 diesel vehicles, nine of which have been in service for five years, but the present construction programme covers the supply of 40 railcars in powers up to 275 b.h.p., and it is probable that at least another score of vehicles will be ordered before the end of 1935. The largest order is for 18 railcars, but the delivery dates will be such that the cars will be introduced over a period of three or four months. The rapid extension of the new form of traction was only to be expected in view of the natural fuel resources of the country, but it is worth noting that some thought has been given to reliable operation when handled by semi-skilled staffs, for only 10 of the 40 cars on order are to embody engines which have not yet been used previously in traction work; the remaining 30 will all embody power units of well-tried designs.

## Staff Training

ONE of the greatest difficulties facing the administration of the Netherlands Railways on the introduction of 35 diesel-electric trains in May and June of last year was the necessity of giving adequate instruction to what must have amounted to hundreds of men in the course of a few weeks, and to the impossibility of doing this may be traced some of the failures which occurred. The training of sufficient drivers within a short space of time can be done with little trouble when three or four vehicles are concerned, but at once becomes a major problem when the number of units is increased tenfold. However, it is nothing to the training of the running shed staff. Some months must elapse before men trained and experienced in steam locomotive work can be turned into successful maintenance gangs for diesel locomotives and railcars, and to have 35 double-engined trains brought into use at one and the same time within a comparatively restricted area probably caused a good deal of confusion, whereas with a gradual introduction, the centralising of the diesel services in a small area would have given the maximum benefit. A small number of vehicles over a period of six to twelve months gives running shed staffs the opportunity of experiencing all the faults which are likely to occur, and without, as a rule, the necessity for returning the unit into traffic with such expedition that the fault cannot be properly remedied or located, and without that haste with unfamiliar objects which conduces to the leaving of waste in the sump or nuts in the cylinders. Moreover, a large number of units put into service at one time all begin to require heavy overhauls about the same period, and yet another set of men—in the repair shops—must acquire their experience with haste, and without the opportunity of checking in service gradually the correctness of the methods adopted. There is, of course, the other end of the scale, which is provided by certain administrations who purchase one small car and run it for three or four years before giving thought to increasing the stock. All that is needed to ensure the success of diesel railway vehicles is a common-sense attitude from engineering, operating, and commercial staffs from the conception of the idea.

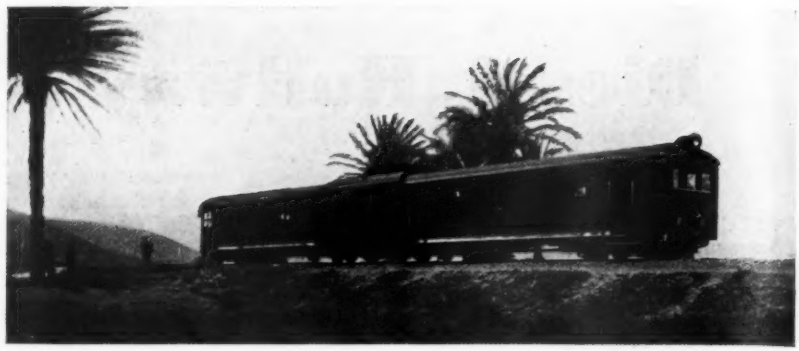
## Pneumatic-Tyred Diesels

THE tests of the Coventry-Michelin pneumatic-tyred railcar on the L.M.S.R. once again brings to the fore the question of employing such units driven by diesel engines. The great defect of vehicles having pneumatic tyres running on steel rails is that the wheel load is limited to about one ton, consequent upon the limited area of contact, and it is this fact which has prohibited the use of the oil engine, except on the Pennsylvania and the Reading Railroads in the U.S.A., where Budd-Michelin cars with Cummins oil engines are at work. (See *Diesel Railway Traction Supplement*, February 24 and December 1, 1933). In these cases the load per wheel is approximately 1·0 tons. The lightest diesel engine yet used in railway traction weighs about 9·5 lb. per b.h.p., or $2\frac{1}{4}$ times the weight of the power unit in the Michelin vehicle. The weight of the engine, transmission, and mechanical portion going up on the cumulative principle, it is probable that if an oil engine was installed in the car now running on the L.M.S.R., the tare weight would go up from 8·5 tons to 10·25 tons and the fully-laden weight to 15·5 tons, which, under the best conditions, would not require an increase in the number of wheels. The possibilities of the pneumatic-tyred diesel car are sufficiently attractive to warrant immediate research, and at least one British manufacturer is taking up the matter of producing a lightweight engine of suitable proportions. A note of caution may be sounded here. We do not think it desirable that an endeavour should be made to get an oil engine of a weight equivalent to that of a petrol engine, or say $3\frac{1}{2}$ to 4 lb. per b.h.p. A reliable engine of 7 lb. per b.h.p. running at 2,500 r.p.m. would solve the problem, and although in years to come it is possible that the oil engine will rival the petrol unit as regards weight, it would be a retrograde step to wait for that millennium. The disastrous accidents to petrol cars in Italy and Brittany during the last two years have shown that the fire risk is by no means negligible, and in Italy has led to the petrol car being superseded by the diesel for new construction. Fortunately the problem of weight is not so serious as might be imagined, for the Michelin car, with 17·8 b.h.p. per ton of gross weight, is overpowered unless high rates of acceleration up steep grades are contemplated, and a railcar with 12 b.h.p. per ton of gross weight would give all the acceleration thought desirable by the fare-paying passenger.

XUM

# DIESEL TRACTION DEVELOPMENT IN SPAIN

***Notable progress has been made on the big Spanish lines within the last few months***

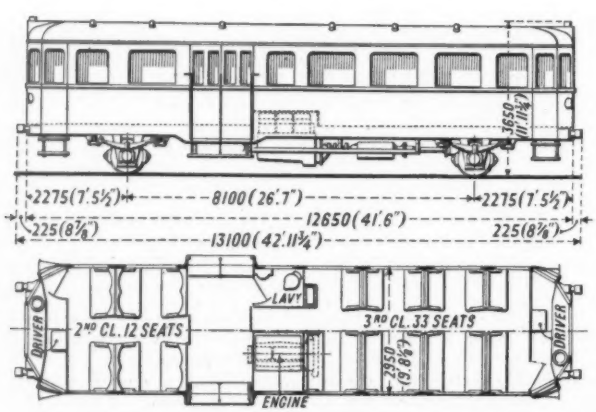


***Above:* 150 *b.h.p. diesel-mechanical set train for suburban services out of Malaga***

***Left: One of the new* 150 *b.h.p. diesel-mechanical Ganz railcars built for the* 5 *ft.* 6 *in. gauge lines of the Northern Railway of Spain***

ALTHOUGH six years have elapsed since the first diesel railway vehicle was set to work in Spain, diesel traction has remained almost stagnant until the last three or four months. Continued lowering of receipts has now brought about the introduction of diesel-engined railcars on a respectable scale, and by Easter there will be 26 vehicles at work on broad and narrow gauge systems.

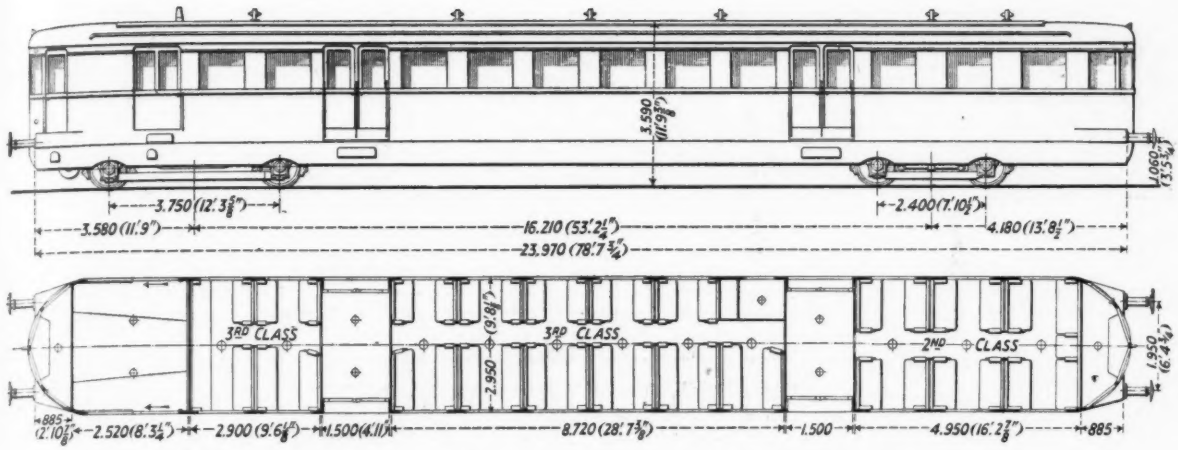
The slow progress made since the three Beardmore-engined vehicles were sent out in 1928 to the Pamplona-San Sebastian Railway (a full description of the successful performance of these vehicles was published in the issue of this Supplement for November 2, 1934), may be traced in part to the desire of the Spanish Government that as much railway material as possible should be built in the country, and until recent months, Spanish firms have not had the necessary equipment or experience. As a bar (which has proved very effective) to the ingress of a flood of foreign material, high tariff walls were raised. It is probable that in the near future, some exemption will be granted to certain railcar constituents if these are to be incorporated in Spanish-built cars. The following figures show the magnitude of the import duties now in force:—




***General layout of* 150 *b.h.p. Ganz diesel railcar on the Norte***

| Material | Gold pesetas | Silver pesetas |
|---|---|---|
| Two 150 b.h.p. diesel-mechanical cars, complete | 19,000 | 45,200 |
| Components (including power units) of three 400 b.h.p. diesel-electric cars | 43,000 | 102,340 |
| Components (including power units) of seven 150 b.h.p. diesel-mechanical cars | 35,000 | 83,300 |
| Components (including power units) of two 90/95 b.h.p. diesel-mechanical cars | 8,000 | 19,040 |

The diesel railcars which have been at work in the Iberian Peninsula for some years comprise the following, the delivery dates being given in brackets: three 200 b.h.p. diesel-electric railcars with Beardmore engines on the Pamplona-San Sebastian Railway (1928); two 110 b.h.p. diesel-mechanical railcars with M.A.N. engines on the Caridad de Aznalcollar (1928); one triple-car articulated 150 b.h.p. diesel-mechanical suburban train with a Maybach engine on the Ferrocarriles Suburbanos de




*Fast diesel-electric railcar with 400 b.h.p. Ganz engine, Northern Railway of Spain*

Malaga (1930). All these vehicles were described in the issue of the *Diesel Railway Traction Supplement* for June 16, 1933. Nearly two years ago some of the big Spanish railways invited tenders for a total of more than a dozen cars, and the fruits of this interest are the 21 broad-gauge railcars and four driving trailers now running on, or in course of delivery to, the Norte, the Madrid, Zaragossa & Alicante, and the Central of Aragon Railways.

### Activity on the Norte

The programme drawn up by the administration of the Norte comprised the supply of 14 diesel railcars of four different types, covering both fast and slow passenger service, with and without trailers. In three of the four types, the mechanical portions were to be built in Spain; but in the fourth instance, the two 150 b.h.p. four-wheeled Ganz railcars, (see one of the illustrations at the head of this article), the complete vehicle was obtained from Hungary. The leading particulars are as given in the accompanying table.

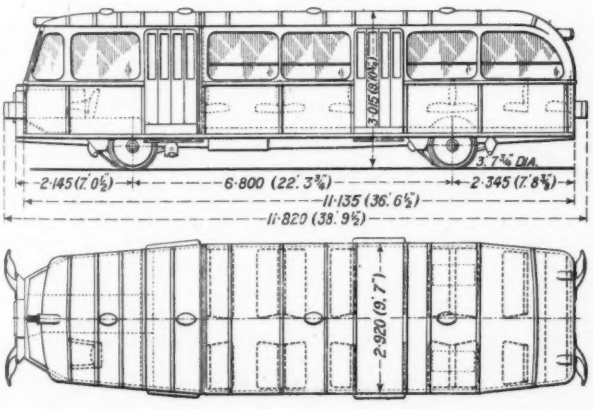
The Beardmore and small Ganz vehicles are now in service, and the remainder are undergoing their trials. The 150 b.h.p. Ganz car has 12 second class and 33 third class seats and lavatory accommodation arranged as shown in one of the accompanying diagrams. The body is of all-metal construction with a driving compartment at each end and the engine slung beneath the centre of the car; the whole layout is similar to that of the four-wheeled Ganz cars on the Belgian National and Hungarian State Railways (see *Diesel Railway Traction Supplement,*

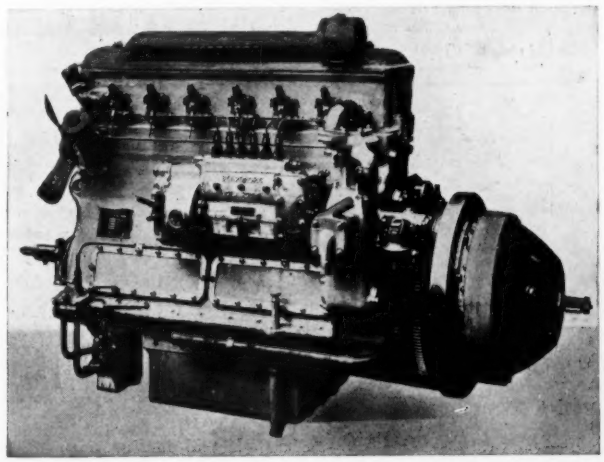
DIESEL RAILCARS OF THE NORTHERN RAILWAY OF SPAIN.

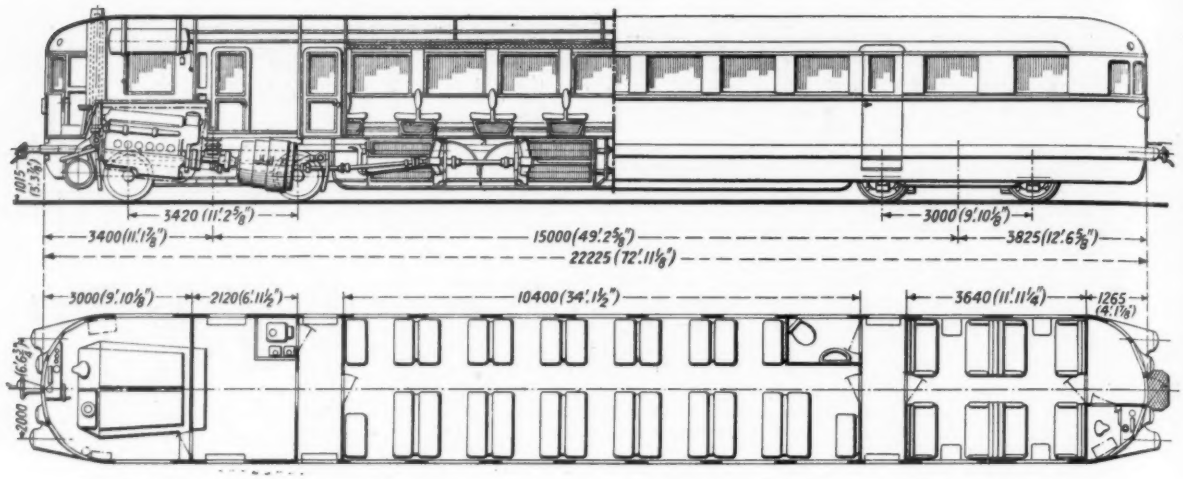
| Main Contractor. | Material Movil y Construcciones. | Geathom. | Soc. Espanola de Constr. Naval. | Ganz & Co. |
|---|---|---|---|---|
| Number of railcars | 7 | 3 | 2 | 2 |
| Type | Two-axle | Double-bogie | Two-axle | Two-axle |
| Number of driving axles | One | Two | One | One |
| Maximum speed, km.p.h. | 90 | 100 | 90 | 90 |
| Overall length | 42 ft. 9 in. | 79 ft. | 38 ft. 10 in. | 41 ft. 7 in. |
| Number of seats | 52 | 101 | 40 | 45 |
| Tare weight, tonnes | 12·0 | 47·5 | 11·0 | 14·0 |
| Engine horsepower | 150 | 400 | 95 | 150 |
| Engine make | Maybach | Ganz | Beardmore | Ganz |
| Transmission | Mechanical (Mylius) | Electric (Lemp) | Mechanical (Somua) | Mechanical (Ganz) |

*Right: 95 b.h.p. Beardmore diesel engine*

*Below: Beardmore-engined railcar on the Norte*






*Diesel-electric railcar with 410 b.h.p. Maybach engine used for trailer haulage on the Madrid, Zaragoza and Alicante Railway*

May 18, 1934, and October 5, 1934 respectively), but the tops of the cooling water radiators at each end of the car are level with the top of the roof. One pair of 29·5 in. wheels is driven through a five-speed gearbox and reverse bevels, and both axles are carried in roller bearings.

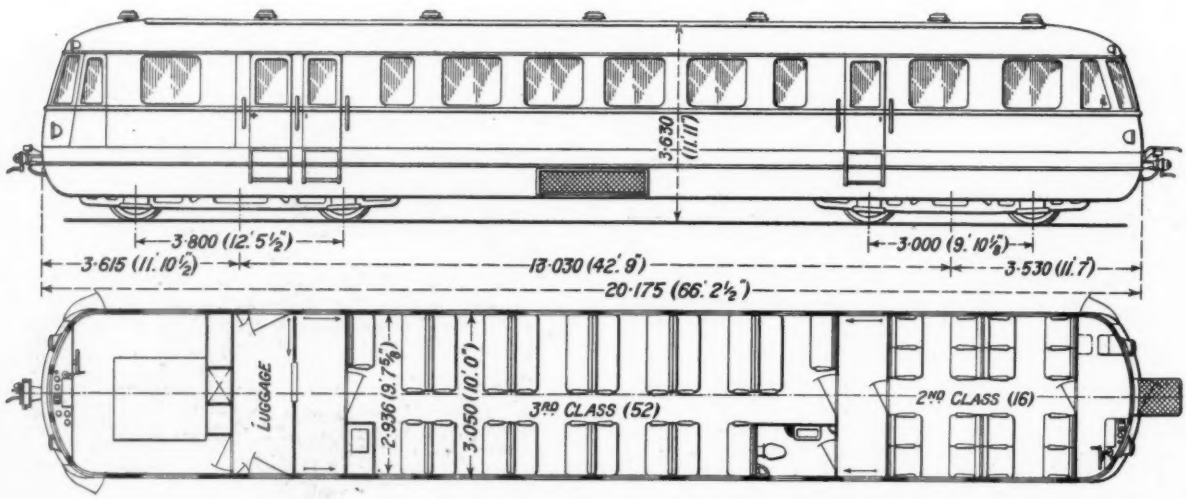
Of somewhat smaller dimensions, the two Beardmore-engined railcars are arranged more in the manner of a motor-bus, and have a driving position at one end only. The passenger accommodation is all of one class, and two folding doors are located on each side. The engine is in front, beside the driver, and its torque is transmitted to one axle through a four-speed gearbox and cardan shafts; its output is sufficient to propel the fully laden car (16·5 tonnes gross) up a 1 in 66 grade at 37 m.p.h. Although only one axle is driving, sand can be applied to all four wheels. Heating of the passenger compartment is effected by the exhaust gases from the engine. There is room for approximately one ton of luggage and light goods immediately behind the driver.

The double-bogie 400 b.h.p. Geathom car is intended for the haulage of trailers at fast speeds. The Ganz engine used in these vehicles was illustrated in the issue of this Supplement for December 28, 1934, and is the same as the 365/400 b.h.p. Stork-Ganz engines used in the last five trains of the Netherlands Railways. Second and third class seats are provided, but no lavatory accommodation.

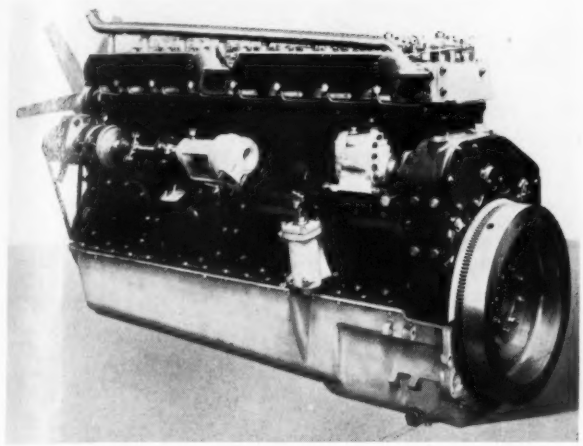
## M.Z.A. Railcars

Although the programme of the Madrid, Zaragoza & Alicante Railway is not so comprehensive as that of the Norte, it possesses several features of interest. First, an order was placed for four 410 b.h.p. diesel-electric cars (all to one design) and four driving trailers of two types; the railcars can be worked in either direction by themselves or with one or two trailers, according to the traffic and schedules. The arrangement of this type of railcar is shown in the diagram at the head of this page. Secondly, an order has been placed for a further car to be powered by a two-stroke engine of Burmeister & Wain manufacture. (See illustration at bottom of this page). Thirdly, all the above diesel railcars and driving trailers are equipped with Scharfenberg automatic multi-purpose couplings, the functioning of which was described in our issue of December 28, 1934.

The four Maybach-engined cars are for use on the hilly Madrid-Aranjuez-Cuenca line and are required to maintain




*250 b.h.p. diesel-electric railcar with Burmeister & Wain two-stroke engine, M.Z.A.*

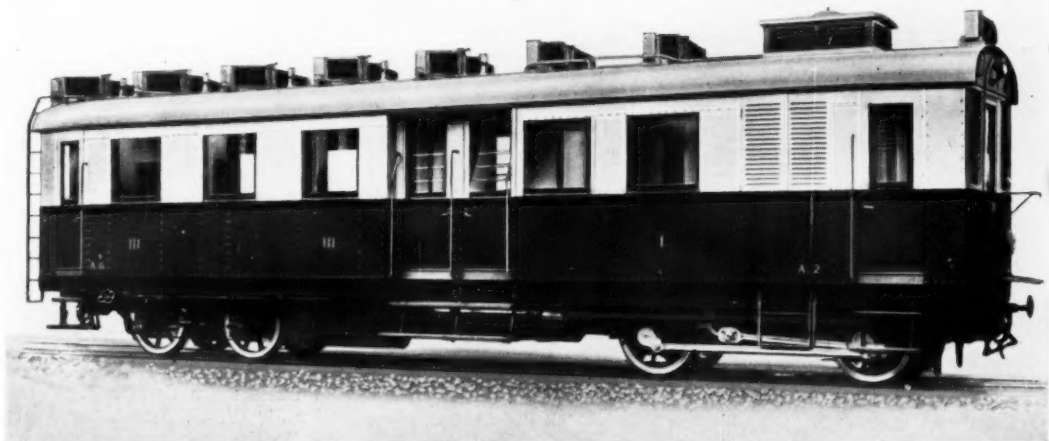


150 *b.h.p. Deutz engine as used in the railcars of the Central of Aragon Railway*

diesel cars and driving trailers, lavatory accommodation is provided. The engine and generator are mounted on the underframe at one end, and the wheels of the bogie at the other end are driven by two traction motors. All the axles are carried in S.K.F. roller bearings. The two-stroke engine has six cylinders of 135 mm. bore by 220 mm. stroke. (5·33 in. by 8·7 in.). Any of the trailers mentioned earlier can be hauled by this car if required.

### Central of Aragon Railway

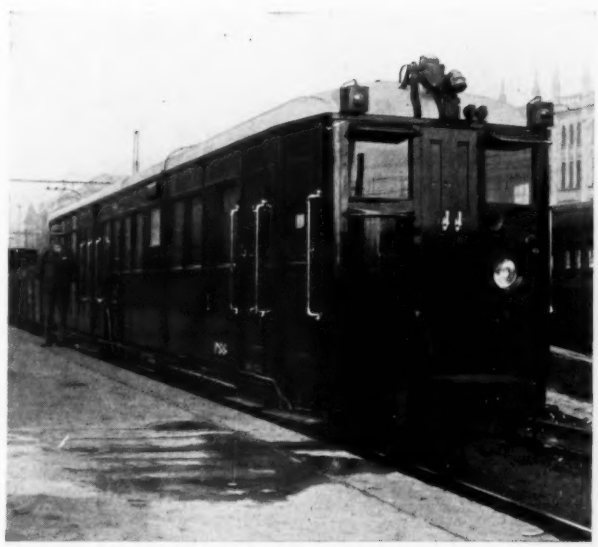
For the replacement of steam trains over certain sections of line, the Central of Aragon Railway (which has the standard Spanish gauge of 5 ft. 6 in.), has just converted two old six-wheeled coaches into four-wheeled diesel-mechanical cars. The power unit of each is a six-cylinder 150 b.h.p. Deutz engine as illustrated on this page, and the mechanical transmission is of the Mylius type, operated by compressed air from the Knorr drum brake system. These railcars are 14·4 m. (47 ft. 3 in.) long over buffers, and have a wheelbase of 8·0 m. (26 ft. 1½ in.); there are 80 third class seats and room for 20 standing passengers, and the weight of the car in working order is 30 tonnes.



*Diesel-mechanical railcar with M.A.N. engine which has run for five years on the Aznalcollar Railway*

a speed of 70 km.p.h. (43·5 m.p.h.) up 1 in 60 grades when running alone, and 44 km.p.h. (27·5 m.p.h.) when hauling a 30-ton trailer. The weight of the car with supplies is 45 tonnes, and with full complement of passengers, 52 tonnes. The 12-cylinder Maybach engine and its attached generator is mounted directly on one bogie; two nose-suspended traction motors are located on the other bogie and drive the 920 mm. (36-in.) wheels through gears with a ratio of 3·58 : 1. The control of the transmission system is of the Brown Boveri servo field-rheostat type. All the axles are carried in S.K.F. roller bearings, and braking is on the Knorr compressed air system with shoes applied to drums secured to the wheel centres. Seats for 16 second-class and 64 third class passengers are provided in the railcar; the first type of driving trailer seats 102 third class passengers and has a small amount of luggage room on a tare weight of 24 tonnes; the second pattern has 81 seats and a postal compartment on the same tare weight.

The Burmeister-engined railcar is of slightly smaller size, and seats 16 second class and 52 third class passengers on a tare weight of 36·3 tonnes. As in all the M.Z.A.



*Diesel-electric railcar at San Sebastian (Amara) station*

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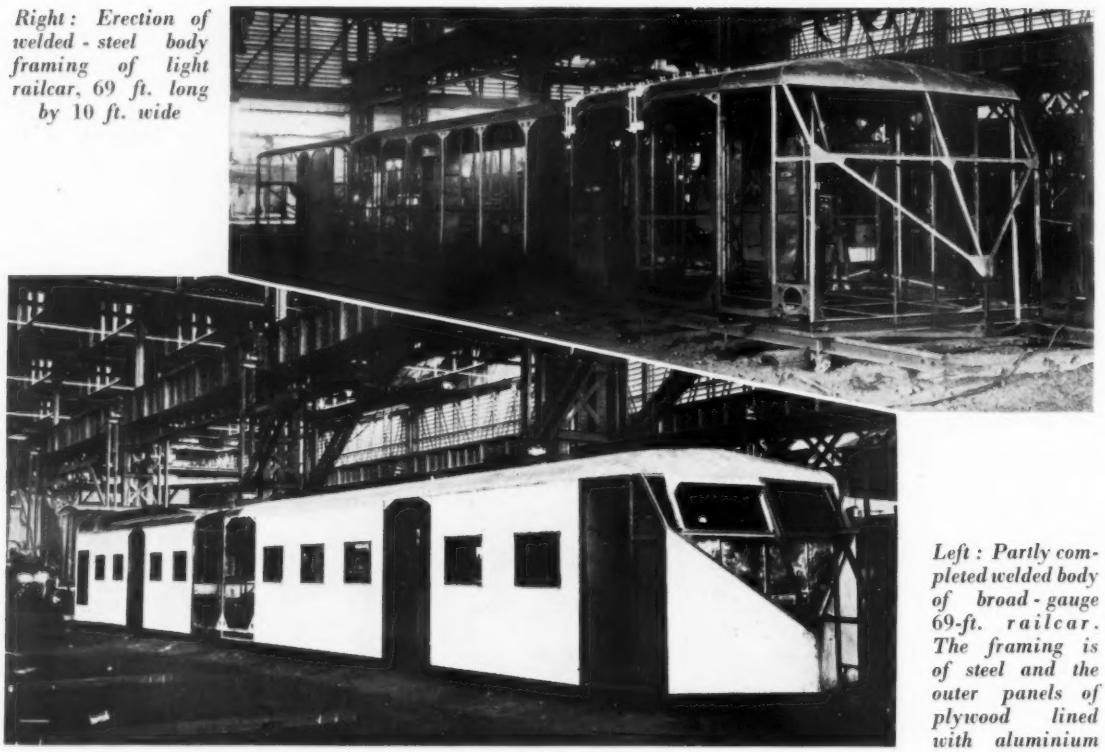
# MADRAS AND SOUTHERN MAHRATTA RAILCARS

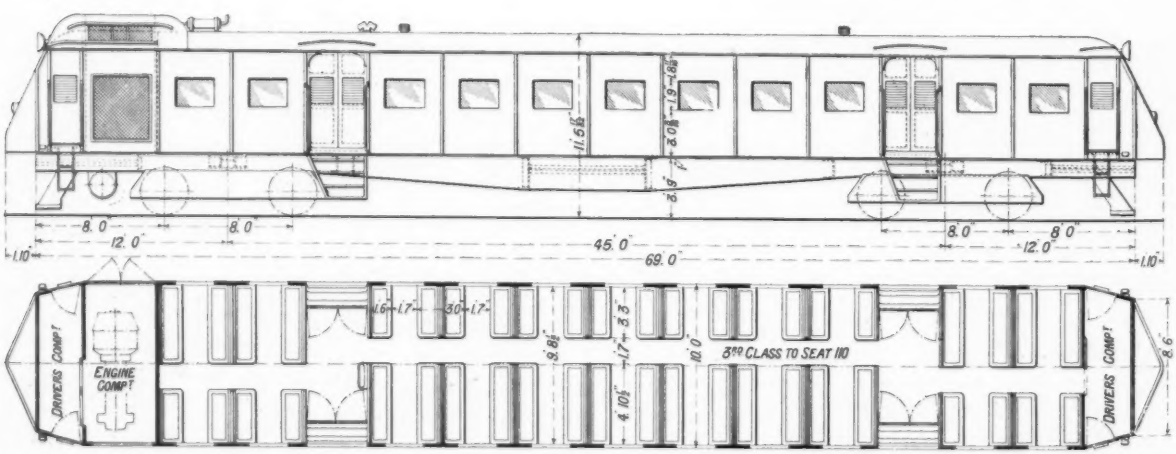
## *Further particulars of the six new diesel-electric vehicles which have been built for branch line services*

*Right: Erection of welded-steel body framing of light railcar, 69 ft. long by 10 ft. wide*



*Left: Partly completed welded body of broad-gauge 69-ft. railcar. The framing is of steel and the outer panels of plywood lined with aluminium*

DETAILED particulars of the welded steel bodies of the six diesel railcars of the Madras & Southern Mahratta Railway, and general notes on the conditions which led up to the inauguration of a diesel service, were given exclusively in this Supplement for January 25, and in the present article the design and construction of the power unit and chassis are described. These components were built by Sir W. G. Armstrong-Whitworth & Co. (Engineers) Ltd. to the specifications and inspection of Messrs. Rendel, Palmer & Tritton, Consulting Engineers to the M. & S.M.R., and to the general design of Mr. R. Lean, the railway company's Chief Mechanical Engineer.



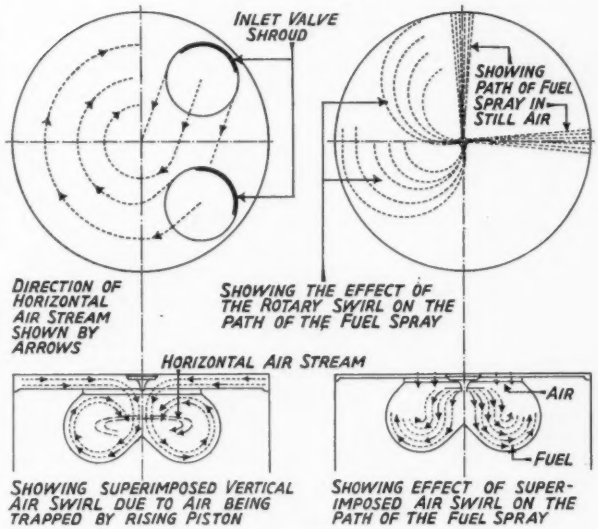

*Layout of 150 b.h.p. diesel-electric broad-gauge railcar, Madras & Southern Mahratta Railway*

Seating accommodation for 110 third class passengers is provided within a length of 69 ft. and a tare weight of 27 tons. The lattice-girder underframe is of the type originated by Armstrong-Whitworth in 1933 for the San Paulo Railway train; it is welded throughout, and is fitted with light cowcatchers and bumpers. The drawgear is in the form of a tubular strut pin connected at either end to suitable sockets on the buffer beam, and has knuckle joints to allow for vertical displacement. In addition to ample rigidity in the vertical direction, the main underframe members are strongly braced transversely by diagonal strips with a gusset in the middle.

The bogies are of the box-frame type with spring bolsters supported on helical springs. The box type of frame was evolved by Armstrong's for application to the 1,700 b.h.p. mobile power houses of the Buenos Ayres Great Southern Railway, and has since been used in numerous diesel vehicles. Apart from the lateral stiffness, the main advantage is that the frames, axleboxes, and laminated bearing springs are all on the same centre line. In this Indian design, the weight of the underframe and body rests on spring-supported side bearers located on spherical self-aligning seats. The bogie centre is used only as a pivot, and, in consequence, the bolster has been made as a comparatively light pressing.

The power unit consists of a 150 b.h.p. six-cylinder Armstrong-Saurer engine and a direct-coupled d.c. generator, which are mounted on a subframe and placed transversely across the railcar in a compartment immediately behind one driving cabin. The power-unit can be removed easily by rolling it out on to a staging, and the water tanks, radiator and gravity tank for the fuel are also mounted on a light frame and can be removed *en bloc*. The cylinders have a bore of 5·1 in. and the pistons a stroke of 7·1 in. The cylinder heads of the engine incorporate the latest Armstrong-Saurer developments of the dual turbulence system, which, it is claimed, has given a considerable reduction in fuel consumption. The curves supplied to us show that at about 65-75 per cent. of rated output, the consumption is 0·39 lb. per b.h.p. hr., and at full load about 0·45 lb. per b.h.p. hr. Four valves a cylinder (the inlet valves are shrouded) and central injection are employed, and the theoretical air swirl is as shown in one of the accompanying illustrations. Fuel is injected by means of a C.A.V.-Bosch pump.

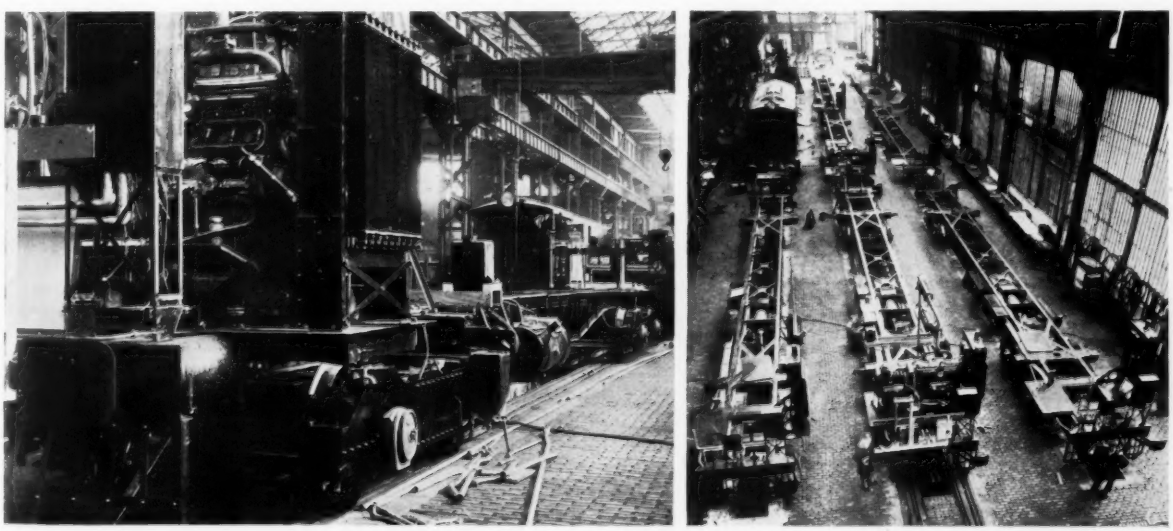
Only one electric traction motor is used, and this is


INLET VALVE SHROUD
SHOWING PATH OF FUEL SPRAY IN STILL AIR
DIRECTION OF HORIZONTAL AIR STREAM SHOWN BY ARROWS
SHOWING THE EFFECT OF THE ROTARY SWIRL ON THE PATH OF THE FUEL SPRAY
HORIZONTAL AIR STREAM
AIR
FUEL
SHOWING SUPERIMPOSED VERTICAL AIR SWIRL DUE TO AIR BEING TRAPPED BY RISING PISTON
SHOWING EFFECT OF SUPERIMPOSED AIR SWIRL ON THE PATH OF THE FUEL SPRAY

***Sketches showing the way in which the air is given the horizontal and vertical swirls to ensure complete combustion of the oil charge in the new Armstrong-Saurer engine***

suspended from the underframe; a cardan shaft with two Hardy-Spicer universal joints takes the drive to worm gear on the inner axle of the bogie at the engine end. The driving axle is splined to receive the worm wheel, and the gear case runs on deep-groove ball bearings and has cooling fins and large oil capacity. The torque reaction is taken up by radius links and lugs on top of the gearcase. A storage battery and the switchgear are carried beneath the car underframe. The transmission control is on the ABE system, which is inherently self-adjusting to all conditions of speed and load.

Westinghouse straight and automatic air brakes of the latest pattern are fitted, with a separate cylinder on each bogie applying two blocks on each wheel for five of the cars; the sixth vehicle has drum brakes similar to those used on the 95 b.h.p. Armstrong-Saurer railbus on the L.N.E.R. Hand brakes are provided in each driving position. Air sanding, with electric control, is fitted.



***Two views of the power unit and chassis of the Madras & Southern Mahratta railcars***

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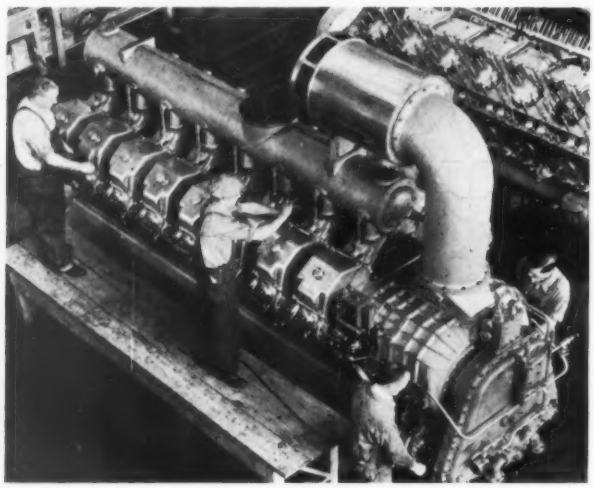


*1,200 b.h.p. Winton two-stroke engine, which is to be installed in the next Union Pacific train*

**New Diesel Cars in France.**—The Ch. de fer de l'Est has put into service two new four-wheeled cars with a seating capacity of 38 in two classes and a tare weight of 18 tons. These vehicles were built by Baudet, Donon & Roussel, and are fitted with 135 b.h.p. Mercedes-Benz engines and Cotal electrically-controlled mechanical transmission. They are similar to the P.O. Midi cars illustrated on p. 176 of our issue of January 25.

**Fast Summer Diesels in Germany.**—The first part of the Reichsbahn programme for working the principal main lines by super-speed diesel trains will come into operation on May 15, when it is intended to inaugurate services with 11 streamlined trains over the following lines: Berlin-Cologne; Berlin-Munich; Berlin-Leipzig; Berlin-Dresden; Berlin-Königsberg; Berlin-Breslau-Beuthen; Hamburg-Cologne; Nürnberg-Stuttgart. According to the *Kolnische Zeitung*, the Berlin-Cologne service will be maintained by two diesel trains. Leaving Cologne at 7.10 a.m., the up train will be scheduled to arrive in Berlin (Friedrichstrasse) at 12.20 p.m., after stopping at Dusseldorf, Duisburg, Essen, Dortmund, Hamm, Hanover, and Berlin (Zoo). On the down trip, Berlin (Friedrichstrasse) will be left at 7.11 p.m. and Cologne reached at 12.18 a.m., with the same intermediate stops except that at Duisburg. The 5 hr. 20 min. overall time of the up journey corresponds to an overall average speed for the 360 miles of 69·6 m.p.h., and the 5 hr. 07 min. in the reverse direction to 71·9 m.p.h. At present the fastest steam train takes 7 hr. 07 min. The Berlin-Königsberg service will run through the Polish corridor.

# NOTES

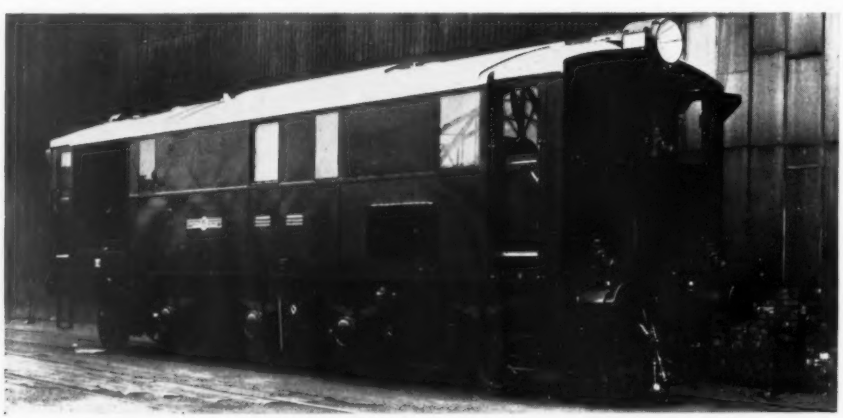
**Hugo Junkers.**—The death of Hugo Junkers, founder of the famous Junkers Motorenbau A.G. occurred on February 3. Junkers developed the two-stroke opposed-piston engine, and units of his firm's design are now installed in numerous railcars in France and Syria.

**G.W.R. Suburban Railcar.**—On February 5, the A.E.C.-engined suburban railcar of the Great Western Railway (described in the issues of this Supplement for July 14 and November 3, 1933), completed its first year of operation over the Thames valley lines, during which time it covered over 60,000 miles and carried 136,000 passengers.

**High-Power American Diesel Engine.**—The 16-cylinder Winton two-stroke engine illustrated on this page is now being mounted in the latest streamlined train of the Union Pacific Railroad. The rated output of 1,200 b.h.p. is developed at 700 r.p.m. The cylinders are 8·0 in. diameter by 10·0 in. stroke, and the weight about 20·5 lb. per b.h.p. We understand that the quoted price for one of these engines is about £7,000.

**Diesel Vehicle Whistles.**—There have been one or two instances recently in which shunters have complained that they were unable to hear the warning whistle of a diesel locomotive as easily as that of a steam locomotive. To give a warning which shall be audible under all conditions without deafening everybody within a radius of half a mile, the Kockums Mekaniska Verkstads A.B., of Sweden, have developed the Typhon whistle. It is used, among other diesel applications, in the shunting locomotives of the Netherlands Railways described in the issue of this Supplement for September 7, 1934. The British agents are The Industrial & Mining Supplies Co. Ltd., 4, Lloyds Avenue, London, E.C.3, and Mr. J. Alfred Lowndes, 36, West Sunniside, Sunderland.

**Inauguration of Main-Line Diesel Service in Ceylon.**—The accompanying illustration shows one of the two 800 b.h.p. 1-Co-1 diesel-electric locomotives which have begun operation in the mail train link between Colombo and Talaimannar on the broad-gauge section of the Ceylon Government Railways. These locomotives were built by Armstrong-Whitworth and are powered by an eight-cylinder Armstrong-Sulzer engine running at 700 r.p.m. The weight is 78 tons and the maximum speed 70 m.p.h. During the trial period, the maker will maintain the machine and will be paid 75 per cent. of the cost of steam traction for the same mileage.



*One of the two 800 b.h.p. Armstrong-Whitworth diesel-electric locomotives now running on the broad-gauge main lines of the Ceylon Government Railways*

# NEWS

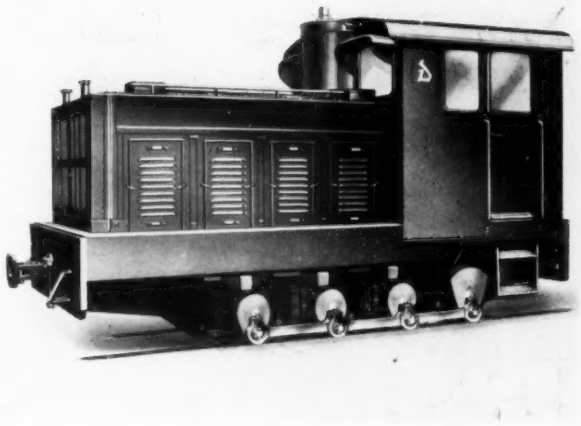
**Slow Train to Hell!**—The illustration on this page shows the first diesel railcar of the Norwegian State Railways (described in the issue of this Supplement for November 30, 1934) en route from Trondhjem to Hell, a small junction near the Swedish frontier which boasts of a carbide factory. The 270 b.h.p. car is hauling an ordinary third class coach as a trailer and is engaged in stop-anywhere service.

**Maybach Anniversary.**—The 25th anniversary of Maybach Motorenbau G.m.b.H. was marked on December 15 last by celebrations in the Zeppelin Casino at Friedrichshafen. Dr. Karl Maybach, who founded the firm in association with the late Count Zeppelin, gave a survey of the work done in the fields of air, rail, and road transport, and recalled the achievements of his father, Wilhelm Maybach, in the last-named sphere when working in conjunction with Gottlieb Daimler.

**Manchurian Fast Cars and Trains.**—A new design of Sulzer 500 b.h.p. engine is to be fitted to four new express railcars which are being built for the South Manchuria Railway. Two further units are being built throughout in Japan. These units will haul two or three trailers to fast schedules on the S.M.R. main line between Dairen, Tashichiao, and Mukden, and are to be fitted with Timken roller bearings. It is also proposed to use articulated super-speed trains over the 436 miles of main line from Dairen to Hsinking, the capital of Manchukuo. Smaller diesel cars, built throughout in the Far East, are now in service on the Jehol line.

**More South American Diesels.**—Some time ago the Buenos Aires Provincial Railway authorised the purchase of four diesel-electric railcars at a price stated to be 460,000 pesetas each. These railcars are to be powered by 270 b.h.p. Sulzer engines of a new quick-running light-weight type, similar to those now being installed in the light railcars of the Swiss Federal Railways described in the issue of this Supplement for September 7, 1934, and in the Central Argentine cars mentioned in the next column.

**County Donegal Railways Increases Diesel Stock.**—Another 74 b.h.p. diesel-mechanical railcar of the same type as that described in the *Diesel Railway Traction Supplement* for June 15, 1934, has been acquired by the Co. Donegal Railways for stop-anywhere passenger service on the Strabane-Stranorlar-Killybegs line. The body and underframe were built in the Dundalk shops of the Great Northern Railway (Ireland), and the power bogie by Walker Bros. (Wigan) Ltd. A Gardner engine is used.



*175 b.h.p. diesel-mechanical locomotive built by Deutsche-Werke, of Kiel, for a narrow gauge railway*

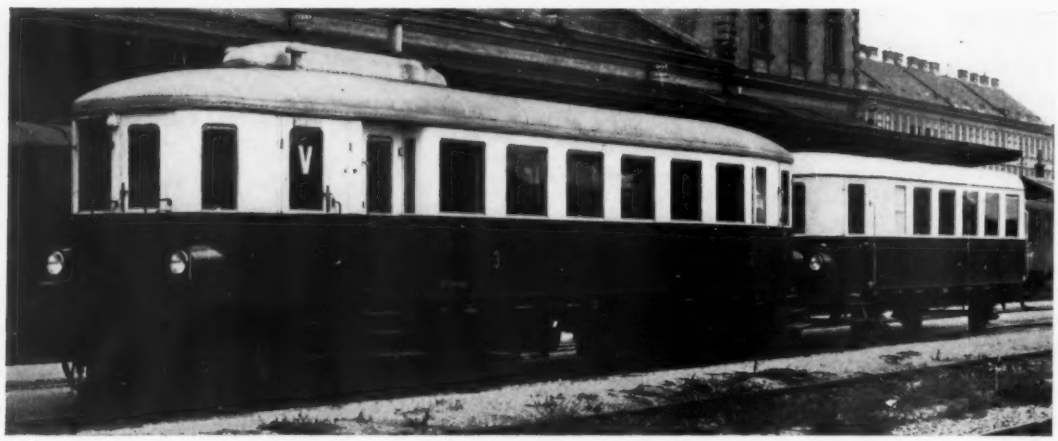
**Diesel Traction in Scotland.**—Tests with the English Electric 300 b.h.p. diesel-electric locomotive have recently been made by the L.M.S.R. over its underground line between Bridgeton Cross and Glasgow Central (Low Level) with a view to showing how the smoke nuisance of steam locomotives may be abated. One of the 130 b.h.p. Leyland diesel-hydraulic railcars of the L.M.S.R. has also been operating in passenger traffic in the Hamilton and Airdrie district.

**Important Central Argentine Diesel Order.**—The Birmingham Railway Carriage & Wagon Co. Ltd. has received an order from the Central Argentine Railway for two twin-articulated and four single unit diesel-mechanical railcars, each fitted with a new type of Armstrong-Sulzer engine developing 275 b.h.p. at 1,150 r.p.m. and 290 b.h.p. at 1,200 r.p.m. Two of the single cars and the two articulated cars will be fitted with S.L.M. mechanical transmission and the remaining two single cars will be fitted with a Vulcan-Sinclair hydraulic coupling and Wilson pre-selective epicyclic gearbox. One each of the single cars fitted respectively with the Wilson and the S.L.M. gear will have the Electro-Magnetic Brake Company's design of radial arm axlebox. Roller bearings will be used throughout for the axleboxes and Girling drum brakes will be employed. J. Stone & Co.'s pressure ventilation, heating and lighting systems will be used. The single cars will accommodate 75 passengers, and the double cars 149 passengers, all one class in each case. The cars will be semi-streamlined with aluminium-panelled bodies, and the interior finished in Rexine.

*The new four-wheeled 270 b.h.p. diesel-mechanical railcar of the Norwegian State Railways, hauling a trailer in the Trondhjem district. An eight-speed gearbox is provided*

# NEW DIESEL RAILCARS AND LOCOMOTIVES IN AUSTRIA

*By E. R. KAAN, Chief Electrical Engineer, Austrian Federal Railways*



*160 b.h.p. diesel-electric railcar, Austrian Federal Railways*

IN the issue of this Supplement for October 6, 1933, two types of diesel-electric vehicles operated by the Austrian Federal Railways were illustrated and described. Of each type ten vehicles were delivered and have been in service since with very good results. The 300 b.h.p. locomotives are mainly used for hauling light goods and passenger trains on secondary lines, and make a mileage of 6,000 a month; the 160 b.h.p. double-bogie passenger railcars attain a mileage up to 12,500 miles a month, and two of these ten cars keep up an express train service between Vienna and Klagenfurt, each car making a round trip of 500 miles a day. Other cars of this type are employed in quite a different way, being used for local traffic between cities and stopping every mile or so, in which service they have regained traffic previously lost to road transport.

The operating costs are low with both types of vehicles. The fuel cost amounts to 12 groschen (0·837d. at par) a mile with the 160 b.h.p. cars and 24 groschen (1·674d.) a mile with 300 b.h.p. locomotives; the lubricating oil costs 3·0 groschen (0·21d.) and 8·8 groschen (0·61d.) per mile respectively, and the maintenance-repair costs amount to approximately 1·0d. and 2·0d. These favourable results have induced the Federal Railways to extend the use of diesel-electric vehicles. It was found that for certain purposes there is a demand for vehicles with as small a tare weight as possible, in order to increase the maximum speed and to compete successfully with road traffic. Therefore two new types of diesel railcars have recently been ordered, viz., two double-bogie and one 6-wheeled railcars, all of which are being built by the Simmeringer Maschinen- und Waggonfabriks-A.G., in Vienna. For both classes the Gebus system of electric transmission will be used, and the electrical equipment will be supplied by A.E.G.-Union, Elin, and the Austrian Brown-Boveri Works. Both types of railcar (see accompanying illustrations) will have large compartments with upholstered third class seating accommodation, and space for luggage will be provided in the driver's box. The car ends will be rounded in the same way as the existing 160 b.h.p. vehicles, and round the frame a streamline sheet-iron apron will be arranged. Each bogie of the larger car will carry the engine-generator-set and a nose-suspended traction motor; the 6-wheeled car is to have only one bogie, carrying the engine-generator-set and a nose-suspended motor, and a single axle carrying another nose-suspended motor.

*New 145 b.h.p. diesel-electric locomotive hauling light passenger train on narrow-gauge section of the Austrian Federal Railways*

Both types will have the usual buffing and drawgear to enable them to haul trailers formed of normal carriages. The heating of the cars is to be effected by steam, produced in an oil-fired boiler situated in a special compartment.

The main particulars of the vehicles are as follow:—

| | |
|---|---|
| *Double-bogie railcar, type 1A-A1—* | |
| Tare weight | 40 tonnes |
| Weight in working order, including passengers and luggage | 48 tonnes |
| Maximum speed | 68 m.p.h. |
| Seating accommodation | 78 |
| Two diesel engines, each of | 210 b.h.p. |
| Two generators, each rated at | 130 kW. |
| Two motors, each rated at | 116 kW. |
| *Six-wheeled railcar, type 1A-A—* | |
| Tare weight | 23·6 tonnes |
| Weight in working order, including passengers and luggage | 30·0 tonnes |
| Maximum speed | 53 m.p.h. |
| Seating accommodation | 38 |
| One diesel engine, as in double-bogie car | |
| One generator as in double-bogie car | |
| Two motors, each rated at | 58 kW. |

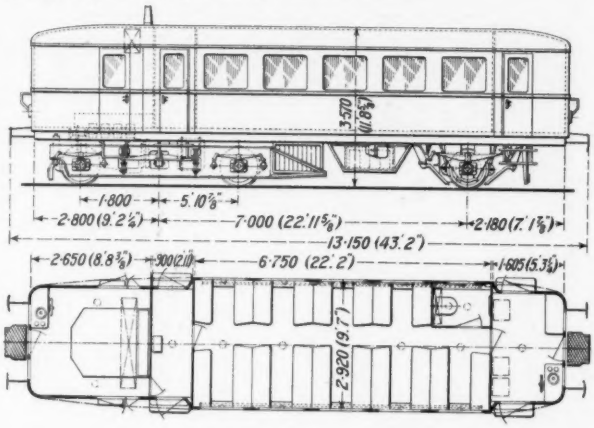
## New Diesel Locomotives

Two diesel-electric locomotives for 750 mm.-gauge lines have been supplied within the past twelve months by the Simmeringer Maschinen- und Waggonfabriks-A.G., the electric equipment of which was built by the Oesterr. Siemens-Schuckert-Werke. These locomotives, as illustrated in this article, are being used on the local line from Ruprechtshofen to Gresten, which branches off the electrified St. Pölten-Mariazell-Gusswerk narrow-gauge line. It would not pay to electrify the first-named section as the traffic is insufficient, but as it has to provide for a certain amount of goods transport in addition to the passenger traffic, the employment of diesel-electric locomotives to replace the steam engines used before seemed more expedient than using railcars.

The main particulars are:—

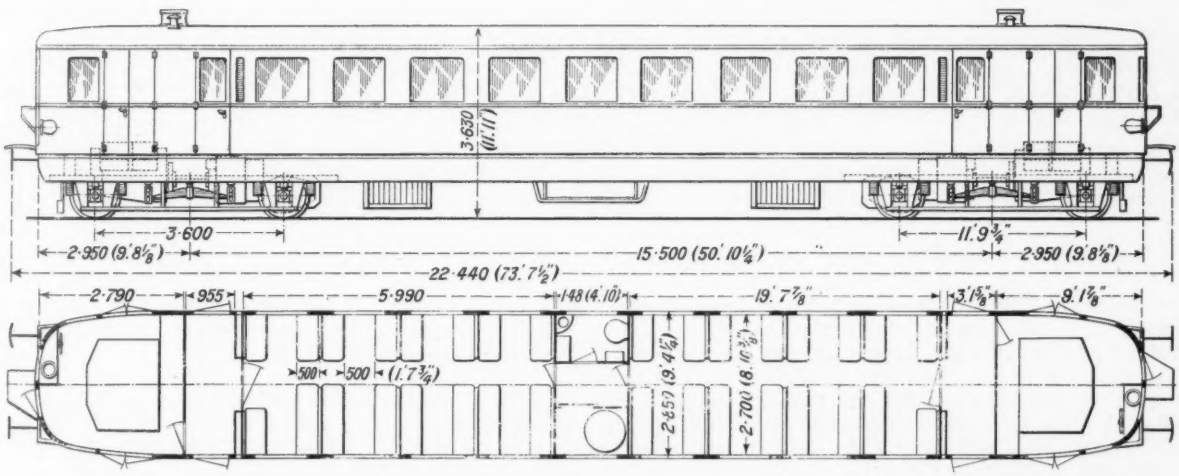
| | |
|---|---|
| Type | Bo |
| Tare weight | 11·5 tonnes |
| Weight in working order | 12·0 tonnes |
| Maximum speed | 30 m.p.h. |
| One diesel engine, developing (at 1,500 r.p.m.) | 145 b.h.p. |
| Electric transmission system | Gebus |
| Main generator rated at | 86·5 kW. (400 V, 216 A) |
| One main generator | |
| One auxiliary generator rated at | 0·9 kW. |
| Two traction motors, each rated at | 38 kW. |

Experience with these engines at work has proved most satisfactory. The fuel oil consumption is approximately 190 gr. (0·418 lb.) per b.h.p. when fully loaded, and 210 gr. (0·46 lb.) per b.h.p. at half load.




*Right: Arrangement of new Austrian diesel-electric railcar for local passenger traffic on standard-gauge lines*

*Below: Arrangement of 420 b.h.p. diesel-electric railcar now being built for fast passenger service in Austria*




## Big Argentine Diesel Order

The Argentine State Railways has during the course of the present month placed an order with Ganz & Co. Ltd., of Budapest, for 18 metre-gauge double-bogie diesel-mechanical railcars each powered by a Ganz-Jendrassik engine having a maximum output of 275 b.h.p. The engine and general design of the car will be not unlike those of the units now maintaining an express service between Budapest and Vienna, and the engine-transmission ensemble will be mounted on one bogie. It is possible that an order for a further 16 cars may be placed after six months. Of this number, 11 will be the same as those just ordered, two will be for standard-gauge lines, and three for 5 ft. 6 in. gauge lines. The last five cars will not necessarily be of the same power as the narrow gauge units. All types of passenger traffic will be operated by these vehicles.

XUM

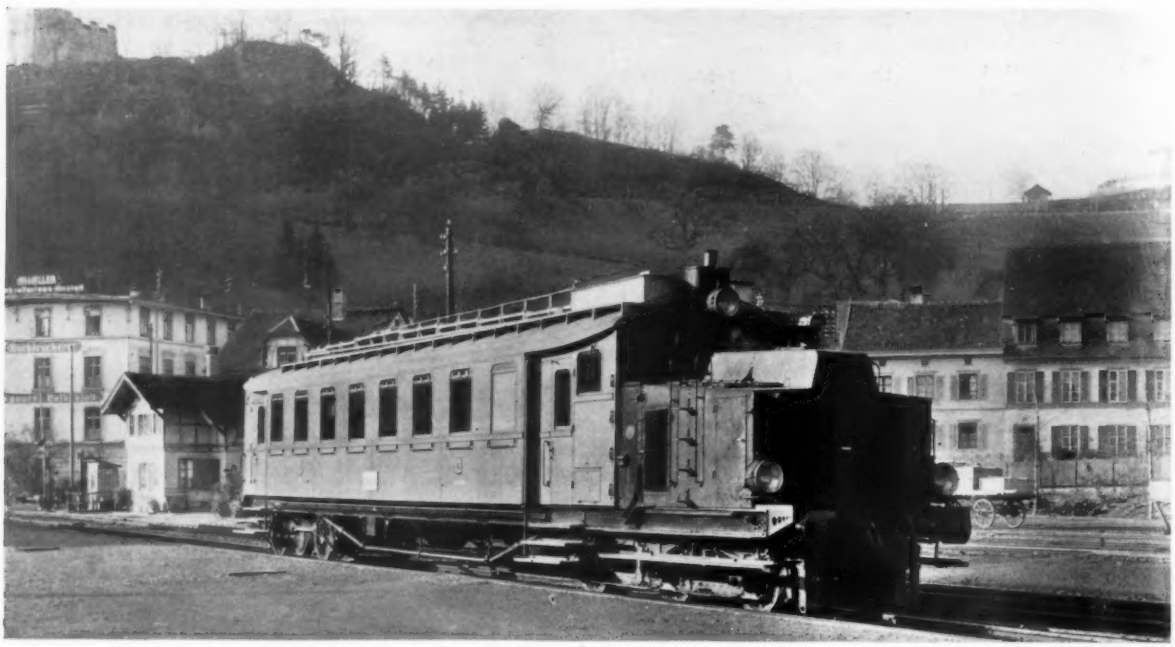
# DIESEL RAILCARS ON SWISS PRIVATE RAILWAY

## *Results over eleven years of operation*

IN 1923, the Val de Travers Railway acquired from Sulzer Bros., of Winterthur, two diesel-electric railcars of 200 b.h.p. for operating passenger trains to slow schedules between Travers, Fleurier, St. Sulpice, and Buttes, all of which towns are close to the French frontier of Switzerland. The length of the line is scarcely 10 miles, and this, together with the slow speed, accounts for the fact that the gross mileage of the cars since they were purchased does not exceed 350,000, although the hours of service extend from 5.24 a.m. to midnight each day. The normal annual mileage per car varies from 14,000 to 17,000, but during the winter only one car is in traffic.

| Cost | Swiss fr. per train-km. | Pence per train-km., at par | Pence per train-mile, at par |
|---|---|---|---|
| Fuel and lubricating oil | 0·154 | 1·463 | 2·35 |
| Wages ... ... ... | 0·190 | 1·810 | 2·91 |
| Maintenance and repairs | 0·100 | 0·950 | 1·53 |
| Net operating cost ... | 0·444 | 4·223 | 6·79 |

The lubricating oil bill varies greatly, partly owing to fluctuation in price, but also increasing as the general shopping period approaches; the limits are from 0·13 to 0·225



*200 b.h.p. Sulzer standard-gauge diesel-electric railcar, Val de Travers Railway*

Both the design of the cars themselves and that of the diesel engines are now obsolete; nevertheless the cars continue to give economical operation, and effect a saving of over 40 per cent. (excluding capital charges) compared with steam traction. The 200 b.h.p. six-cylinder V-type Sulzer engine is located in a bonnet at one end, and, together, with the direct-coupled generator, is mounted directly on a six-wheeled bogie; the other end of the car is supported on a four-wheeled bogie which carries two traction motors. Contrary to normal practice, the torque of these motors is transmitted to a central jackshaft and thence to the wheels via coupling rods. The car tares no less than 66 tons, of which 27½ tons are available for adhesion. There is seating accommodation for 68 passengers, and a driving compartment is provided at each end. The maximum speed is 70 km.p.h. (43·5 m.p.h.) and the fuel tank capacity is sufficient for about 300 miles.

From going into service in 1923 until the end of March, 1934, the two railcars together ran 512,711 km. (318,000) miles, including a good number of miles hauling a trailer. Taken over the whole of this period, the operating costs were made up as follows:—

that of the fuel costs. The maintenance and repair cost is anything but excessive, and probably results from the car being of ample size for the work it has to do, and to the low schedule speeds.

Comparative working costs between steam and diesel traction on the Val de Travers Railway over a period of two years are shown in the table below.

| | Total cost, Swiss fr. | |
|---|---|---|
| | Diesel | Steam |
| Fuel ... ... ... ... ... | 16,791 | 76,684 |
| Lubricating oil ... ... ... ... | 2,971 | 3,852 |
| Wages of crew ... ... ... ... | 20,400 | 40,800 |
| Maintenance and repairs— | | |
| Wages ... ... ... ... | 1,700 | 7,600 |
| Material ... ... ... ... | 2,718 | 2,329 |
| Total ... ... ... ... | 44,580 | 131,265 |
| Kilometres run ... ... ... ... | 103,574 | 172,559 |
| Cost per train-km. ... ... Sw. fr. | 0·416 | 0·761 |
| Cost per train-mile (at par) ...pence | 6·4 | 12·2 |

# THE DUTCH DIESEL TRAIN FAILURES

***Useful knowledge should be gained from the troubles experienced with the Maybach-engined sets; the units with Stork-Ganz engines are in regular service***

*Four of the 820 b.h.p. Maybach-engined diesel-electric trains at Utrecht*

IT is widely known that the 35 Maybach-engined diesel-electric trains of the Netherlands Railways were withdrawn from service in August last, following a series of engine breakdowns. We gave a brief résumé of the principal faults on page 727 of our November 2 issue, but since that time certain other information has come to light, not only from the Netherlands Railways, but also from the makers of the engine and electrical equipment.

At the end of August, Mr. Hupkes, the Superintendent of Rolling Stock of the Netherlands Railways, issued a statement to the Dutch press which read as follows:—

> In August some inexplicable failures began to occur with the diesel trains, failures which have not hitherto been experienced with engines of the type in question. An inquiry was instituted and the conclusion reached was that the diesel engines were working under unfavourable conditions on our system. The principal objection was that they ran much of their time at reduced speeds, which caused them to be overloaded. Certain defects were also experienced with the fuel and lubricating oil supply systems. The breakdowns of the trains were in the main attributable to these causes.

Since all the trains were operating under the same conditions it was presumed that they were all liable to the same defects and it was decided, therefore, to submit them all to a thorough inspection. This decision was made on August 23, after the trains had been in service a maximum of ten weeks.

### Engine Maker's View

According to a statement made by Maybach Motorenbau, whose engines were installed, the trains were constructed to meet the definite ideas of the Netherlands Railways. For instance, the engines and power equipment generally were mounted on the underframe in the centre vehicle, and not directly on the bogies, as had been done in Germany and France. With this arrangement (see accompanying illustration), it was not found possible to arrange the fuel tanks in the roof of the car and thus allow of a gravity feed to the engine. The tanks were therefore located beneath the underframe, and air from the brake system was used to feed the fuel from the tanks to the pumps. The tanks themselves were made of aluminium which was so thin as to limit severely the air pressure which could be used. These facts, it is said, were pointed out by Maybach but were not taken into account by the railway company.

A more serious allegation is that the Maybach engineers recommended that the electric transmission characteristics should be arranged to prevent any load being taken up by the diesel engine until a rotational speed of about 1,000 r.p.m. was reached. The equipment actually installed provided for load being taken up at 800 r.p.m., at which speed the generator was capable of dealing with 200 b.h.p. The railway company's engineers are understood to have stated that this would occur only for a moment or two at starting, but it appears that in service these low rotational speeds were used a good deal and the motors were thus overloaded more or less continuously. In addition, the fuel supply was irregular, due to the low air pressure and lack of control. On some occasions enough fuel did not reach the combustion chamber and certain cylinders did not fire. This slowed down the engine, and then the governor caused the injection pumps to increase the fuel charge, overloading the remaining cylinders so badly that shock absorber springs were broken, big-end bearing failures occurred, several pistons were broken, one or two cylinder walls cracked, and a few crankshafts fractured. The position was aggravated by certain defects in maintenance, such as failure to clean the fuel and lubricating oil filters.

As a result of the breakdowns, the Maybach firm now claims that its advice as to the control of the electrical equipment is being taken, and that the fuel supply system is also being changed, and also emphasised that such troubles have arisen only through the special circumstances in Holland, and have not been met with in Germany, France, or Belgium.

### Electrical Equipment Manufacturers

On the other hand, Brown-Boveri, the firm responsible for much of the electrical equipment, in a statement, expresses strong disagreement with Maybach, and says that the engines were not overloaded on account of wrong transmission characteristics, and that at 690 r.p.m. the load actually attained in service was only 95 b.h.p. as a peak, whereas the engine builders had stated that 226 b.h.p. could be attained as a maximum at this speed. Certain faults, however, developed in the operation of the electrical equipment. There were cases of defective working of the electro-magnetic contactors, due to the great voltage variation, and slight defects also developed

in the electro-magnetic speed governor. Further, breakage of the brush-gear cover occurred, and the aluminium fan which supplied ventilation to the traction motors was also broken. Brown-Boveri says that defective material accounted for this to some extent, but the failures were partly due to excessive mechanical stresses at road speeds of 62 m.p.h. One or two breakages occurred in the traction motor pinions, which, at the express wish of the Netherlands Railways, had been fabricated by Krupp.

### Werkspoor View

Werkspoor N.V., who built 20 of the Maybach engines under licence and also 25 mechanical portions of the trains, has, through its London representative, confirmed generally the statement of Maybach, but adds that there was a certain amount of overheating of the big ends which was rectified when the lubrication system was changed. According to this Dutch firm, the transmission equipment was designed so that at an engine speed of 800 r.p.m. the load would be 150 b.h.p. At this speed the combustion pressure is not sufficiently counteracted by the inertia forces, and a rapid increase in the combustion pressure produces sudden mechanical shocks. Frequent working under such conditions led to many defects developing in pins and bearings, but Werkspoor considers that a modification whereby the lowest rate of power revolutions would be 1,000 per min. would remedy this.

The case of the Dutch trains is somewhat different from that of the Flying Hamburger, in which the Gebus system in actual fact is used only for starting; the diesel engine runs at the rated speed of 1,400 r.p.m. nearly all the time. In Holland, a speed of 90 m.p.h. was proposed as a maximum, but as neither the track nor the signalling was suitable for such speeds it was decided to limit the maximum to 62 m.p.h. until such time as operating conditions were suitable. This reduced the rotational speed of the diesel engines and increased the troubles. Regarding the fuel supply system, Werkspoor believes that the installation of a small feed tank in the roof would put things right, and this firm also suggests that the right kind of oil was not used for the cylinder lubrication and that deposits were formed which led to the damaging of piston crowns and rings.

### Conclusions

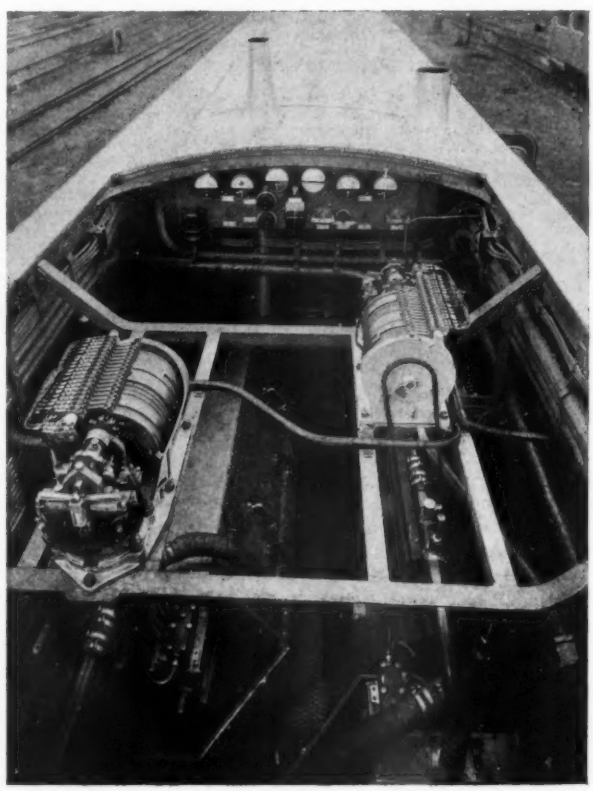
Although it seems to be generally agreed that the characteristics of the diesel engine and electrical equipment were not properly co-ordinated, we believe that a certain amount of the trouble was due to unsatisfactory design and unsuitable material of the pistons, which permitted undue expansion, with deleterious effect on the cylinder walls, big-ends, and on the pistons themselves. It is said that a material with a lower coefficient of expansion has since been substituted. The heating of the big-end bearings, stated to have been experienced at an early period, is an unusual fault with roller bearings; some trouble has been occasioned with these bearings on other Maybach engines, and the result has been pitting and scoring of the rollers and races in a manner which suggested other faults than overheating.

The main source of trouble, however, appears to have been that the modified Gebus transmission had a limiting zone which permitted the engine to develop too high an output at a speed of about 800 r.p.m., and it is difficult to see (if the Maybach statement is true) why the design of the transmission was allowed to be such that load could be taken up 200 r.p.m. below the recommended figure. Of course, there may have been an undiscovered error in the design calculations. Incidentally, the firing order of one cylinder bank was changed to 124653 from the 153624 of the Flying Hamburger original engines.

With the diesel engine in its present state, the Dutch experience is a decided pointer to the necessity of great care being taken in getting the correct relationship between the engine and generator characteristics, especially when it is intended to use a control system which permits the engine speed to be infinitely variable within rather wide limits. If for any reason absolutely constant-speed engine operation is not desired, it would seem preferable to arrange for two, or perhaps three, definite speeds (well away from the criticals) at which the engine may run continuously, in order to give maximum fuel economy when the full-speed full-load rate is not required.

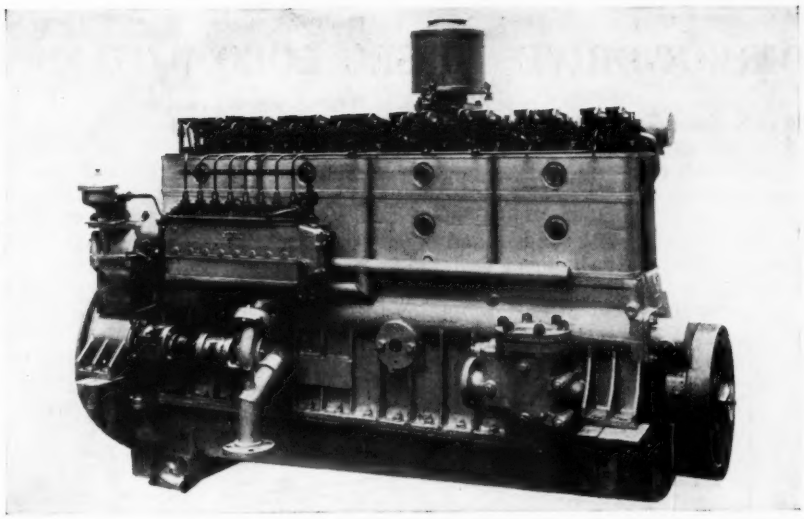
We understand that the transmission is now being modified to prevent load being taken below 1,000 r.p.m. (an arrangement which is used on the streamlined trains of the Ch. de fer du Nord, in France), but with the same type of modified Gebus control it is difficult to see how this will completely rectify the troubles, as the vehicles were designed for a maximum speed of about 90 m.p.h. The rated engine speed and load will naturally be used at this velocity, and apparently it is intended to use this combination at the present maximum traffic figure of 62 m.p.h. But unless running up grade at this latter rate, the engine speed will be the rated 1,400 r.p.m. and the load will not be the rated 410 b.h.p. This will cause the engine speed to drop, for it is a characteristic of the Gebus system that the generator always requires maximum power at the maximum rotational speed. If the maximum output is not required, the driver must diminish the engine speed, and this sets up a new combination of power characteristics.

It is quite understandable that all the *other* faults which developed in the Dutch diesel trains, taken together, would result in severe overloading, and would be able to produce unexpected criticals and upset the normal balance of the



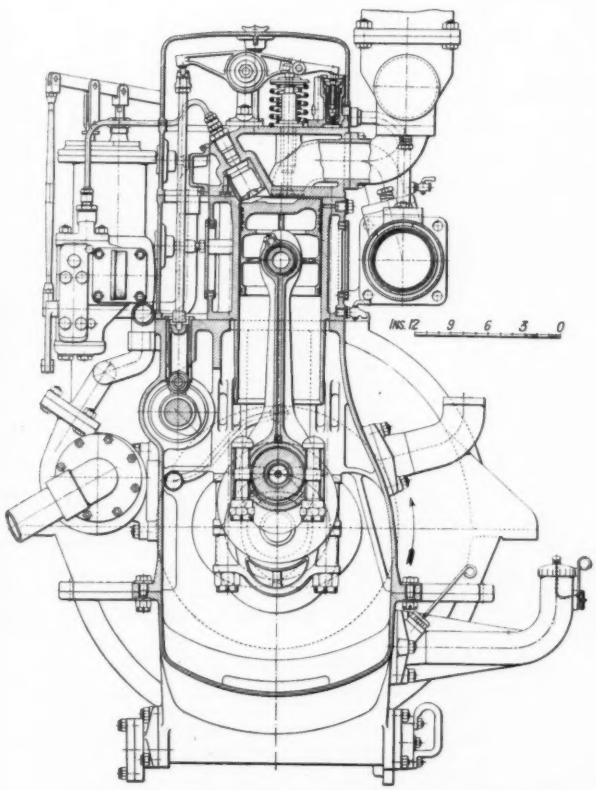
*Layout of engine room of Maybach-engined Dutch train; view taken from hatchway*

engine. Of course, a good deal of trouble must have been caused through the haste with which the whole order was conceived and executed. Even the crying need of substantial reduction in operating expenditure should not have been attempted at the cost of a hurried design, and without trying one or two sets in normal service beforehand. Such a procedure has not been adopted by any other administration, for it is generally recognised that even when two or three high-power high-speed vehicles are set to work first, minor troubles arise which are easily rectified, but which would result in a good deal of disorganisation if a large number of units was involved. Nevertheless, the decision to put 40 triple-articulated trains into service at once must not be blamed on the mechanical department, but rather on those who presented that department with such a demand.



*Fuel-pump side of 400 b.h.p. Stork-Ganz engine as used in five of the Netherlands Railways diesel-electric trains*

As far as we are aware, similar faults have not occurred in the five train sets which are fitted with eight-cylinder Stork-Ganz engines developing 400 b.h.p. at 1,450 r.p.m., and which have been in regular service on the Netherlands Railways since the beginning of November, 1934. The electric transmission in this case was manufactured on Westinghouse principles by Smit, of Slikkerveer, but constant engine-speed control has not been adopted, and six definite designed speeds (including idling) are claimed.




*Cross-section of 400 b.h.p. Stork-Ganz engine*

The engine is provided with the normal Ganz-Jendrassik pre-combustion chamber, and has cylinders of 6·7 in. bore by 8·7 in. stroke. Advanced rating characteristics are a feature, for the design postulates a piston speed of 2,090 ft. per sec. and a m.e.p. of 89 lb. per sq .in. at top rated output, and the weight is equivalent to 16·0 lb. per b.h.p. Some of the main features can be picked out in the accompanying cross-section, but two atomisers are led into one ante-chamber in place of the single unit shown in the drawing. The cylinder block and cylinder heads are of cast iron, and the crankcase, sump, and valve gear casings are of silumin.

The designed speeds of this engine are 960, 1,060, 1,200, 1,300, and 1,400 r.p.m., with 800 r.p.m. for idling; the speed of 1,450 r.p.m. is regarded as an absolute maximum. We were present at the shop tests of one of these engines, and noted the following figures for the output of the attached generator:—

| Engine r.p.m. | Volts | Amps. | Kw. |
|---|---|---|---|
| 960 | 225 | 140 | 31·5 |
| 1,060 | 250 | 820 | 205 |
| 1,060 | 420 | 290 | 122 |
| 1,200 | 450 | 310 | 140 |
| 1,300 | 500 | 330 | 165 |
| 1,300 | 400 | 600 | 240 |
| 1,380 | 250 | 880 | 220 |
| 1,400 | 340 | 550 | 186 |
| 1,400 | 290 | 600 | 174 |
| 1,400 | 200 | 1,050 | 210 |
| 1,410 | 525 | 320 | 168 |

The greatest load in the above table is 240 kW., or 322 h.p., which, at 90 per cent. generator efficiency, is equivalent to an engine b.h.p. of 358, almost equal to the continuous rating of 365 b.h.p. at 1,400 r.p.m. One of these engines was run on the test bed for 64 hr. on end, with only two short stops, one because of a fault in the water-brake, and the other because of some foreign matter which found its way into the atomiser.

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COTAL GEAR.—An interesting brochure covering in a general way the Cotal electrically-controlled mechanical transmission is to hand from the Cotal Chadburn Co. Ltd., of 9, Cloak Lane, London, E.C.4.

XUM

# DIRECT-DRIVE DIESEL LOCOMOTIVES FOR HIGH SPEEDS

THE possibility of obtaining variable torque from a diesel engine, to such an extent as to permit direct coupling to the driving wheels of a locomotive without the increase in weight and cost involved by a transmission system, forms the subject of a recent investigation by Dr.-Ing. A. Finsterwalder and Reg. Baumeister F. Bredenbreuker. The authors deal particularly with the suitability of the direct-drive supercharged diesel for high-speed operation, and arrive at the conclusion that, for

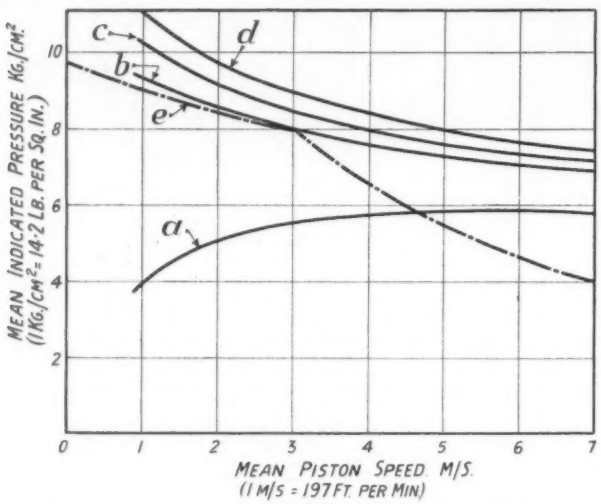


*Fig. 1—Mean indicated pressure curves corresponding to: a, scavenging only; b, c, d, with supercharging; e, steam locomotive characteristic*

equal adhesive weight, it is superior to the steam locomotive and still more advantageous than the diesel-electric locomotive.

The problem demands first a consideration of the power-speed characteristics of locomotives in general. Until recently it was considered that the indicated horse-power of a steam locomotive should be as nearly as possible constant at all speeds. Examination of the characteristics of typical locomotives of the German State Railway shows, for example, that a 4-6-0 express locomotive develops about 1,500 i.h.p. at 118 km.p.h. (73·3 m.p.h.) with a mean piston speed of 7·0 m. per sec. (1,379 ft. per min.). This indicated output is nearly constant over a considerable range of speed, say from 44 to 73 m.p.h., but the effective drawbar h.p. reaches a maximum of about 1,200 at approximately 37 m.p.h. and decreases at higher speeds. At 73 m.p.h. only about 40 per cent. of the indicated h.p. is available at the drawbar; the remainder is absorbed by air resistance and the internal resistance of the locomotive itself. Reduction of air resistance by streamlining increases the available effective power, but in order to obtain adequate power for re-accelerating to the maximum speed, and to permit of high-speed running where there are many curves, it is necessary to have constant or rising drawbar h.p. at high speeds. This distinctive characteristic is best attainable, in the authors' opinion, by the diesel locomotive with direct-drive.

By utilising test data relating to the specific fuel consumption of double-acting, two-stroke diesels at various average piston speeds, and taking account of the increased mean indicated pressure attainable, particularly at low piston speeds, by supercharging from a separately-driven compressor, the authors arrive at the curves reproduced in Fig. 1 from the Z.V.d.I. In this chart, *a* represents the mean pressure with scavenging alone, giving a cylinder charge equal to 55 per cent. of the swept volume of cold air; curves *b*, *c*, *d* represent the pressure with supercharging by compressors respectively absorbing $\frac{1}{7}$, $\frac{1}{6}$, and $\frac{1}{5}$ of the indicated output of the main motor at 1,379 ft. per min. piston speed and 56·8 lb. per sq. in. (absolute) mean indicated pressure; and curve *e* corresponds to the power characteristic of the 4-6-0 express steam locomotive previously mentioned.

The relatively high mean indicated pressures of curves *b*, *c*, *d* at high speeds result in an ample reserve of power. Referring to Fig. 2, *a* represents the percentage indicated power of the steam locomotive at various speeds; *b*, the desired minimum power characteristic of a high-speed locomotive; *c* and *d* the characteristics of the direct-drive diesel, respectively without supercharging and with supercharging corresponding to curve *b*, Fig. 1; and *e* the effective diesel h.p. of a diesel-electric locomotive. The curves $a_1$, $b_1$, and $e_1$ show the power available at the circumference of the driving wheels of the steam locomotive *a*, high-speed locomotive *b*, and diesel-electric locomotive *e*.

From these characteristics it appears that the direct-driving diesel locomotive has a substantial reserve of power at the higher speeds without supercharging, and that a margin at low speeds can be got by medium supercharging.

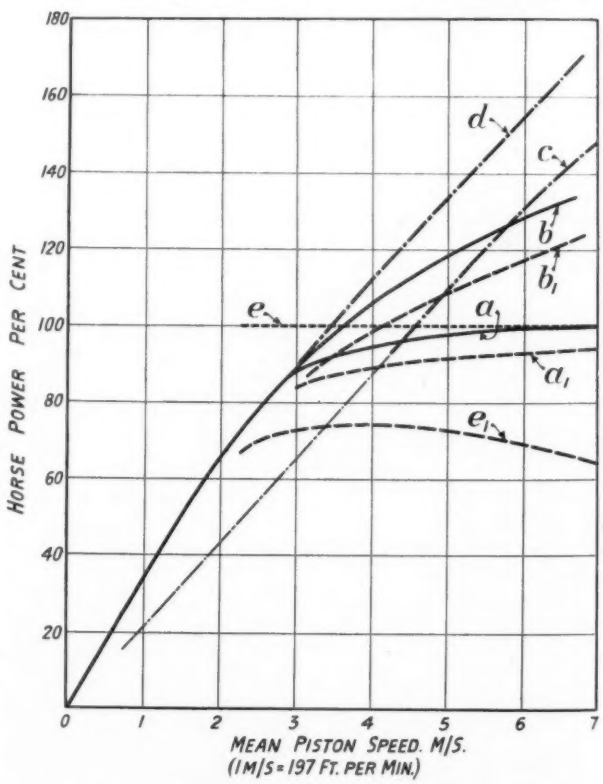


*Fig. 2—Power-speed characteristics for various types of locomotives, for the same adhesive weight*